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ZACHER (F.). Die Afrikanischen Baumwollschädlinge. [African cotton pests.]—Arbeit k. biol. Anst. Land- und Forstwirtschaft, Berlin, ix, no. 1, 1913, pp. 121-230, 83 figs.

Insect pests of the cotton plant in Africa are described at considerable length. The significance of the pests, methods of combat by means of poisons, traps or natural enemies, other plant hosts of the insects, and the immunity of certain species of plants are discussed. Insects which are useful to cotton in preying upon harmful insects are mentioned. The life-history of many of the pests is given. The following is a list of injurious insects, arranged according to the part of the plant they attack.

Damaging the roots: Orthoptera: Brachytrypes membranaceus, F.; Lephdottera: larvae of Euroa segetum, Schill, E. spinifera, Hb., and Agrotis yisilom, Rott; Coleoptera: larvae of Tetralobus sp., Heterodes sp., Acolus inscriptus, Er., Diplognatha gagates, F., Camenta westermanni, Har., Schizonycha serrata, Aulm., Enaria melanictera, Klg., Popillia hilaris, Kr., Symistocalpus bifasciatus, Kr.

Damaging the stem: Coleottera: Alcides brevirostris, Boh., Sphenoplera gossypti, Kert., S. neglecta, Kig., Apate monachus, F., Hypothenemus eruditus, Westw., Apion armipes, Wagn., A. zanthostylum. Wagn.

Damaging the leaves: Rhynchota: Pseudococcus virgatus, Ckil., Chionaspis aspidistrae, Newst., C. aspidistrae var. gossypii, Newst., and Lecanuim nigrum, Nietn.; Obthoyteba: Schistocerca peregrina, Ol., Zonocerus elegans, F., Phymatcus viridipes, Stal., Phanetoptera nana, Fieb.; Lepidopteba: larvae of Sylepta derogata, F., Hymenia (Zinkenia) fascialis, Cram., Basiothia charis, Wlk., Hippotion celerio, L., Celerio lineata, F., var. livornica, Esp., Prodenia litura, F., Euroa segetum, Schiff., E. spinifera, Hb., Agrotis pronuba, L., A. ypsilon, Rott., Plusia confusa, P. circumflexa, Cosmophila erosa, Hb., Porthesia virguncula, Walk., Nudaurelia sp., Tephrina contexta, Saalin., Syngamia abruptalis, Wlk.; Coleopteba: Diplognatha gagales, F., Camenta

westermanni, Har., Schizongeha servata, Aulm., Enaria melanietera, Klv., Popillia hilaris, Kr., Synistovalgus hemipterus, Kr., Epipedosoma laticolle, Kolbe, Systates pollinosus, Gerst., Aphthona sp., Nisotra uniforma, Jac., Syngrus paneticolles, Lef., Ootheen mulabitis, Sahlb., O. bennigseni, Wsv., Titabova raficollis, Ol.,; Rhyxenta: Helopeltis bearothi, Reut., Calalea bohemani, Stal. C. apicalis, Schout., Hotea subfascata, Westw., H. acuta, Stal. Aphism alrae, Koch, A. gossypii, Glov., A. sorghi, Theo.; Acast: Tetrangeleas sp.

Damaging the flower: -Lephoptera: larvae of Earns insulana, Bolsd., Chloridea obsoleta, F.: Coleoptera: Mylalais b'zonata,

Gerst., Coryna hermanniae, F., C. dorsalis, Gerst.

Damaging the holl and seeds: Coleoptera: Diplogratha gagates, F., Apon vanthostylun, Wagu, Cathorama sp., Tribolium ferragineau, F., T. confusum, Duy., Lucmophlowas positius, F., Palarus melinus, Host., P. vatzebregii, Wissun, Silvanos sorimamensis, F., Tenebroides maurelunicus, L., Bruchus chimasis, L., Areocerus fusicioulatus, de G., LEPIDOPTERA: latvae of Chloridea obsoleta, F., Diparopsis castumea, Hupp, Earius insulana, Boisd., E. fabia, Cr., E. chimataria, Wlk., E. plaga, Boisd., Gelechia gossquella, Saund., Pgroderice simplex. WIsm., Stappatophora gossquella, Wism., Agrotis gpsilon, Rtt., Euroa spinifera, Ilb., Ephestia cantella, Walk.; RHYNCHOTA: Dysdericus cardinalis, Gerst., D. fasciatus, Sigu., D. nigrofasciatus, Dist., D. superstiliusus, F., Orgenreius hydiopenais, Costa, O. gassppinas, Dist., O. dudgeani, Dist., O. vritiosus, Dist., D. albidipennis, Stal. Leptoglossus membrunafens, F., Anaplovienis carripes, F.; Diplopoda: Odontopope sp.

The insects useful to the plant are chiefly Hymenoptera, which destroy many injurious species. Alesia striata (Cocct-NELLIDAE) is is mentioned as destroying scale-insects.

Zacher (F.). Die Schädlinge der Kokospalmen auf den Südseeinseln, [Pests of the coconut-palm in the South Sea Islands.] Arbed, k. biol. Anst. Land- and Forstwirtschoft, Berlin, ix. no. 1., 1913, pp. 73-119, 38 text figs.

 Λ complete list of the insect posts of the coconut-palm in the South Sea Islands. In most cases a description is given of the insect, together with details as to its distribution, life-history, and mode of attack. The following species are mentioned:

Coleoptera: Orycles rhimocros, L., O. preussi, Kolbe, Trichogomphus semilinki, Rits. Xylotrapes nimrod, Voet, X. corquini, Deyt. Scapanes australis. Boisd., S. grossepunetatus, Sternbg., Oryctoderes latitarsis, Burm. Pimelopus temaistriatus, Aulm., P. preussi, Aulm., P. robustus, Aulm., P. pygmaeus, Aulm., Horonotus quadrituber, Zacher, Mycterophallus xanthopus, Boisd., Glyciphana versicolor. F., Eubussea dilatata, Zacher, Eurytrachelus pilosipes, Waterh., E. intermedius. Gestro, Metopodontus cinctus, Montr., Rhynchophorus ferrugineus, Ol., Rhabdocuemis obscurus. Boisd., Calandra taitensis, Guér., Atactus deplanatus, Boh., Oxycephala (Xiphispa?) chalybeipennis, Kolbe in litt., Brontispa froggatti, Sharp, Promecotheca antiqua, Weise, P. opacicollis. Gestro, P. reichei, Baly., Xixuthrus costatus, Montr., Olethrius tyramus, Thoms., Stenodontes insularis, Fairm., Monohammus sp., Sessinia livida, F., A. collaris, Sharp., A. palmarum,

Kolbe in litt., Calirrhipis femorata, Waterh; Lepidoptera; Lecuana iridescens, Harpagoneara complexa, Butl., Tinca sp. Orthoptera; Graeffea cocophaga, Newp., Anaulacomera insularis, Stal Theatris pullidas, Walk.; Isoptera: Entermes sp.; Rhynchota: Bushocephalas thanmatomotas, Kirk., Alearodicus sp., A. destructor, Quaint., Aspidiotas destructor, Sign., Farcaspis oceanica, Lind.; Acari: Tetrangchopsis sp., Bdella (!) sp.

The author points out that a great many of the species are probably insignificant as regards the damage done, but he considers that it is desirable to have on record a complete list of the actual and potential pests of this important tree.

FERNALD (H. T.). Insecticides, Fungicides, and directions for their use. Massachusetts State Board of Agriculture, Boston, Circ. no. 2, 1913, 24 pp.

The author gives a comprehensive list of insecticides and fungicides, with formulae and general instructions for their use. A large number of common insect pests are mentioned, and brief advice as to treatment given.

FERNALD (II, T.). Three common scale-insects. Massachusetts Stale Board of Agriculture, Buston, Circ. no. 6, 1913, 10 pp., 6 fies.

The author describes the San José, the Oyster-shell and the Senrfy Scales and gives full directions for the preparation and application of the insecticides most efficacious against these pests.

"WOODWORTH (C. W.). Colling moth control in the Sacramento Valley. Univy. of California, Coll. of Agric., Berkeley, Circ. no. 101, June 1913, 4 pp., 3 figs.

The fruits affected are the apple and the pear. By the use of arsenical poisons the loss can be reduced to about one per cent, or less, As the worm first bores deeply into the fruit it is suggested that the subsequent surface-feeding is the fatal operation, but so far our knowledge is insufficient to explain the reasons for the efficiency of the poison. All investigators agree that it must be applied before the larva enters the fruit. In the case of pears and autumn apples, unless this first spraying has been thorough, a second brood will also require attention in the latter part of July or early in August. Its appearance may be noted if bands of sacking are placed round a few trees and examined about the 1st and 15th of July and August. One thorough spraying for summer apples and one or two for autumn apples and pears will completely control the codling moth in the Sacramento Valley. For a single medium-sized tree, $\frac{1}{2}$ pint of lead arsenate in 5 gallons of water is sufficient. For a quarter of an acre of orchard 3.6 lbs. lead arsenate in 100 gallons of water is enough. Instead of this weight of lead arsenate, one-third of zinc arsenite, or one-quarter of Paris green, may be used. In the latter case lime (three times as much) (CL)

should be added. This holds the arsenical to the tree and also marks the tree so that the thoroughness of the application may be visible to the eye.

WOODWORTH (C. W.). The Woolly Aphls.—University of California, Coll. of Agric., Berkeley, Circ. no. 102, June 1913, 4 pp., 1 fig.

Believed to be of American origin, and called "American blight" by English entomologists, this insect has now been shown to be another form of the elm aphis (Eriosoma ulmi).

"Northern Spy" roots have been used with great success against it in Australia, where it is a serious pest. They are equally efficient in California, and should be used wherever the woolly aphis requires combating. If nursery stock is wanted quite free from the insect, the production of winged forms in the neighbourhood of the nursery should be prevented. Elm trees should be carefully inspected in spring, and as soon as the swollen leaves become conspicuous these should be removed. Apple trees in the vicinity should be kept free from twig infestation. Should the nursery become infested, it is best to dig up and destroy everything that has been attacked, as the wingless forms may spread along the nursery rows. Though this is not the case in California, there are places where treatment is justifiable. The simplest and generally cheapest method is the direct application of kerosene or gasolene with a swab or brush. Too much oil will produce dead spots on the bark. The work is as quick as spraying, and is immediately and completely effectual. The trees should be gone over about once a week in spring until the danger of rapid increase is past. If the insects cannot be economically treated with oil, spraying will be necessary, and a nicotin spray is the best. Nicotin sulphate 40%, 1 lb., and cresol soap 1 gallon, in 200 gallons of water, form an effective solution; the soap simply increases the penetration. Spraying must be thoroughly done. There appears to be no danger of winged forms issuing from the roots, but sometimes it may be desirable to prevent the lice from migrating. The easiest method is to dig out a few shovelsful of earth round the roots and fill in with sand.

Parker (J. R.). The imported cabbage worm and the cabbage aphis.
- Montana Agric, Coll. Expt. Stn., Bozeman, Montana, Circ. no.
28, Aug. 1913, pp. 9-24, 12 figs.

The cabbage heads are rendered unsightly and unfit for a first-class market by the dark green excrement of the "imported cabbage worm" (Pieris rapac, L.), and if they are badly riddled, growth is stopped. It is well to plough under or otherwise destroy all cabbage stumps and leaves remaining from the crop, as they afford ideal breeding places. A few heavily-poisoned stumps may be left to act as traps. A spray, containing either Paris green, arsenate of lead or arsenite of zinc, may be used immediately there is any noticeable injury. The author says that there is no danger in eating cabbage

sprayed with arsenicals. Another cabbage worm found in Montana, the larva of the diamond-back moth (*Plutella maculi pennis*), is amenable to the same measures.

The cabbage aphis (Aphis brassiene, L.), also uses crop remnants for depositing its eggs, and since weeds, such as wild mustard and shepherd's purse, serve as breeding places for the early generations of the lice, they should not be tolerated near cabbage fields.

A most effective spray is: Black leaf tobacco extract, 8 oz.; soap, 4 oz.; water, 4 gals. If "Black Leaf 40" is used, only 3-4 oz. need be taken. The soap makes the spray spread evenly on the waxy surface of the cabbage and makes it penetrate the mealy covering of the lice. Failing tobacco extract, a good alternative is a strong solution of soap; soap or washing powder 1 lb., and water 4 gals.; and for cauliflowers its non-staining property is a real advantage.

CLERC (G. O.). Rapport sur une mission dans le gouvernment d'Oufa pour déterminer les insectes déprédateurs et indiquer les moyens de les combatire. [Report of a commission in the Govt. of Oufa, for the determination of insect pests and the means of combating them.] "Bull, de la Soc. Ouralienne, Amat. Sci. Nat., Eksterinburg, xxxii, no. 2, 1913, pp. 140-145.

In July 1912, the author made an expedition into the district of Oufa with the purpose of examining crops which were being destroyed by insects. In the neighbourhood of Bélébéi, the crops of wheat and oats had at first been very promising, but, as the summer advanced they were attacked by insects, and it was evident that the harvest would be reduced to anything between 50% and 0% of the usual. As the weather at the time of examination was unfavourable for finding insects, the author did not succeed in catching any adults, but he obtained a large number of pupae of Mayetiola (Cecidomyia) destructor, Say, and of Oscinis frid, L. Plants which were unattacked by these insects were often infested with Thrips.

In the district of Birsk the condition of the crops was even worse, especially in the case of wheat. Apaldidae, Cecidomyia, Oscinis and Thrips were found in abundance. Oats had suffered principally from Aphididae and Oscinis. Fields of millet and buckwheat were unattacked. The author advocates ploughing the fields to a depth of 16–20 cms. (6.4"-8"), and burning the stubble with the roots before Cecidomyia and Oscinis emerge from their cocoons.

C.E.S.A.R. (L.). Our most troublesome orchard insects and diseases.—
Forty-fourth Annual Report of the Fruit Growers' Association of
Ontario for 1912, Ontario Dept. Agric., Toronto, 1913, pp. 13-31,
19 figs.

The title sufficiently explains the scope of this paper (see this Review, Ser. A, i, p. 404), in which the author also gives a list of remedies and notes on the methods of their employment.

Felt (E. P.). The use of oils on dormant trees.—Twenty-eighth Report of the State Entomologist, 1912, N.Y. State Mus., Albany, New York, Bull. no. 165, 15th July 1913, pp. 83-92.

The author says that the spraying of dormant trees with oils, especially mineral oils, is one of the more recent developments of insect control, and it has been said by enthusiasts that the application is harmless. He gives examples showing that there are a number of so-called miscible oil preparations on the market the careless use of which is attended with danger, and he summarises his conclusions as follows:

The use of oils or oil preparations on dormant trees has been followed in several cases by severe injury. Trees, as living organisms, respond to climatic and cultural conditions, and as a consequence their power of resisting penetration and injury by oils undoubtedly varies with the season, and probably with age, from year to year. Since certain weather conditions promote injury by oils, it appears impossible to be sure that deleterious effects may not follow the spraying of dormant trees with an oil preparation. Autumn treatment with oil appears to be more hazardous than spring applications. Other things being equal, the author believes that there is less danger of penetration by oil, and consequent injury, if the applications are made in the spring, shortly before active growth begins, as there is then likely to be greater resistance to the entrance of oil, or more rapid renewal of necessary vital tissues that may be destroyed by it.

SHEVIREV (I.). Oviposition in Ichneumon Flies. Jl. R. Micr. Soc., London, pt. 4, Aug. 1913, p. 385.

Iv. Shevirev has experimented with Pimpla instigator and other species, to which he gave pupae of different sizes, e.g., of Sphinx and of Pieris. If only large pupae are supplied the progeny will be almost wholly female; by supplying only small pupae, the female offspring can be practically eliminated. It appears as if the females, like queen-bees, adjusted the kind of egg laid to the nutritive conditions available. In another paper (C.R. Soc. Biol. Paris, lxxiv, 1913, pp. 698-9) the author refers to parthenogenetic females. While the fecundated females lay eggs which develop into both sexes, those haid by virgin females produce males only. In the case of the fecundated females, the eggs which produce males are unfertilised eggs.

HERRICK (G. W.). Control of two Elm-tree pests.—Cornell University, Agric, Exp. Sta., Coll. Agric., Dept. Entom., Ithaca, N. Y., Bull. 333, May 1913, pp. 491-512, 19 figs.

The author reports in detail successful operations against the elm leaf-beetle (taleracella lutcola, Miill.), and the elm leaf-miner (Kaliosysphinga ulmi, Sund.) Arsenicals were employed against the former pest and "Blackleaf 40" tobacco extract against the latter. The author recommends that in planting shade trees adjacent streets should be planted with different species, as thus an outbreak of any single pest can be easily checked and controlled.

GRAY (G. P.). Analyses of insecticides for users, "University of California, College of Agriculture, Berkeley, Circ. no. 105, Aug. 1913, 7 pp.

The California Insecticide Law provides that "the Directory of the Agricultural Experiment Station of the University of California shall, upon the receipt of a sample of the insecticide, accompanied by a nominal fee of one dollar, furnish to the user of the said commercial insecticide, such examination or analysis of the sample as will substantially establish the conformity or non-conformity of the said insecticide to the guarantee under which it is sold."

It is pointed out that a complete analysis will not usually be made, but only such an examination or analysis as will fulfil its object, and also that analysis will not be made for dealers. The great care which is necessary when drawing a sample is specially insisted on.

WOODWORTH (C. W.). The Amended Insecticide Law, University of California, College of Agriculture, Berkeley, Circ. no. 101, Aug. 1913, 10 pp.

This pumphlet gives the full text of the law of 1911 enacted in California, as it now stands, with footnotes commenting on each of the changes.

GEHRMANN (K.). Krankheiten und Schadlinge der Kulturpflanzen auf Samoa. [Diseases and pests of cultivated plants in Samoa.]

Arbeit, k. biol. Anst. Land. and Forstweitschaft. Berlin, ix. no. 1, 1913, pp. 1-120.

The rhinoceros beetle (Orgetes chinoceros) is the chief insect pest of eccount palms in Samoa. The palm-bore (Rhepael ophoros ferraginess) which is found throughout the Indian Archipelago, and also in New Guinea, the leaf eating coco moth (Lecuma irdescens) and the dreaded coco scale-insect (Aspaliotos destrodar) are all, at present, absent from Samoa. After discussing at some length the possibilities of combating the rhinoceros heetle, the author gives the instructions issued by the Government in the Straits Settlements and in Singapore in connection with this pest, which may be briefly summarised as follows:—All infested trees are to be burnt or burned, or sunk in water, so that the eggs, larvae, pupae and beetles will be destroyed. Anyone keeping on his land dead cocount palms, etc., which would barbour the beetle, is to be fined: and Government officials shall be allowed to enter gardens and plantations for the purpose of seeing that the instructions are carried out.

There seems to be no direct method of combating the pest. The danger for Samoa lies in the fact that the beetle has only recently been introduced; it is likely, therefore, to multiply considerably, and Samoa offers every condition favourable to its spread.

CARPENTER (G. H.). Injurious Insects and other Animals observed in Ireland during the year 1912. -Econ. Proc. R. Dublin Soc., ii, no. 6, Aug. 1913, pp. 79-104, 9 figs, 2 pls.

Grubs of the Garden Chafer (Phyllopertha horticola), were received in September from Co. Galway, where it is said that they do the greatest damage to "second grass." Rooks were observed to pull up the dead plants in order to get at the grubs. Specimens of the Frit Fly (Oscinis frit) were received from Co. Dublin. Turnips, with the sub-globular galls due to the maggots of the Root-gall Weevil (Ceuthorrhynchus pleurostigma, Marsh.), were received in March from Co. Galway, and in April, from the neighbourhood of Belfast. Cabbage and cauliflower plants were received from Co. Clare, the stems of which were bored by a somewhat large Curculionid grub, not yet identified. The injury ultimately kills the plants. The only measure that can be recommended is the removal and burning of the infested plants. Specimens of the Potato-leaf Beetle (Psylliodes affinis) were received from Co. Tipperary and Co. Kerry. In Ulster, the Flax Flea-Beetle was very active in 1912; spraying with lead arsenate is suggested. Specimens of small white Annelid worms, of the family Enchytraeidae, were received from Co. Monaghan, with the statement that they were injuring oelery, carrots, parsnips, and onions. They have been identified as Enchytraeus albidus, Henle, which is very common in farmyard manure. Celery roots were sent in February from Co. Down, tunnelled by the maggots of the Carrot Fly (Psila rosae), proving that they can live through a mild winter. One sample of apple shoots sent from Portadown, was found on 29th May to be infested with Aphis pomi, A. sorbi, Psylla mali, and caterpillars of the Winter Moth (Cheimatobia brumata) and of a species of Tortrix. Later on, more Aphis sorbi were sent from Counties Antrim, Waterford, and Dublin, and Aphis opmi from Waterford and Tipperary. In July an apple shoot especially badly infested by the Woolly Aphis was received from Co. Limerick. The Apple Sucker (Psylla mali) did a vast amount of damage to apple blossoms in May 1912. Specimens of shrivelled buds containing the insects were received from Counties Dublin, Kerry, Armagh, and Tyrone. In some cases the hairy black fly, Bibio marci, was noticed in numbers around the injured blossoms and was wrongfully accused of causing the damage. Specimens of the ruddy Shield Bug, Acanthosoma haemorrhoidale, were sent, in February, 1912, from Co. Cork, where they were sucking the unopened buds of apple trees. From Rathfarnham specimens of the Clay Vine Weevil (Otiorrhynchus picipes) were received, with information that the young black-current bushes were badly damaged; entire shoots were sometimes devoured. Phyllobius oblongus and P. viridiacreus are recorded as damaging apple foliage.

Caterpillars of the Winter Moth (Cheimatobia brumata) were very abundant in many parts of the country, feeding on apple, plum, currant, and gooseberry. Apple shoots disfigured by the webs of the Small Ermine Moth (Hyponomeuta malinellus) were received in April and May from Co. Dublin. Apples bored by the caterpillars of the Codling Moth (Cydia pomonella) came from Co. Clare in June. Caterpillars of the Common Bell Moth (Tortix ribeana) were found in May eating apple shoots in Co. Dublin. For their destruction early spray-

ing in April with lead arsenate wash is recommended. Apples containing larvae of the Apple Sawly (Hoplocampa testudina) were received from Counties Tyrone, Tipperary and Kildare. The Pear Gall Mite, Eriophyos pyri, and the Black Currant Gall Mite, E. ribis, were reported, the former from Co. Dublin, the latter from Co. Kerry. The acclimatisation in Ireland of the Australian Fern Weevil (Syagrius intrudens) is recorded; ten years ago it was extremely destructive to ferns in the Royal Botanic Gardens, Glasnevin, and now it is breeding in the open.

PICARD (F.). Sur un Braconide nouveau parasite de Sinoxylon sezdentatum, Ol., dans les sarments de vigne, [On a new Braconid parasite of Sinoxylon sezdentatum, Ol., on vine shoots.] Bull, Soc. Entom., France, Paris, no. 16, 1913, pp. 399.402, 1 fig.

Sinoxylon sexdentatum is the most common Bostrychid in the South of France; it is found in vine branches, which it reduces to a state of dust. Many enemies of this insect are known; some preduceous, such as Histerids, Malachiids, and Clerids; others parasitic, such as the Acarid, Pediculoides centricosus, and the Proctotrypid, Cephalonomyja formiciformis. The author is the first to record a Braconid parasite of this beetle. The species which he describes is new, viz., Monolexis laragnei, and was taken in large numbers from 8. sexdentatum infesting vines. The insect is not exclusively parasitic upon 8. sexdentatum, but has been found in connection with Scobicia pusticitata, F., and Xylonites pracustus, Germ. It may also attack Scolytids.

SCHALVINSKY. Непарный шелкопрядь въ Лебедянскомъ льсничествь. [Lymantria dispar in the Lebediansk Forest. (Govt. of Tambov)]. «Льсная жизнь и Хозяйство» ["Forest Life and Economy"]. Published by the Tambov Administration of Agriculture and State Domains, Tambov, 1913, no. 5, pp. 9-14.

The Matiushin estate of the Lebediansk forest has frequently been visited by Lymantria dispar, especially those plots where oak plantations are more or less mixed with birch and aspen, and where the "tchornosiom" soil is covered by a rich growth of grass. The age of these attacked plots is 40 80 years, the thickness of the trunks from 0.6 to 0.8 metre. The insect practically avoids young plantations up to 20 years old, as well as thin plantations or glades. They also seem to avoid light, usually starting to eat the foliage on the windward side and in places where the trees are dense. The larvae emerge from the eggs in the middle of April, and pupation usually begins from the 13th to 26th June. Should there be rain and a change to cold weather, the larvae perish without pupating. The pupae are found on the branches and trunks, and a month later (13th 26th July) the perfect insects appear. The females oviposit in the lower cracks of the bark, laying their eggs in groups of 20-50, and the moths disappear in the middle of August.

The author describes the result of destroying the unhatched eggs by scraping, burning, or scattering them. These remedies invariably

gave only partial results, as some of the eggs developed even in unfavourable positions. According to Shevirev, L. dispar is seldom dangerous in natural forests, and he recommends fighting the insect only in natural woods growing under unfavourable conditions, or near plantations, nurseries or orchards; in any case, he recommends smearing the egg-masses with naphtha. The author gives an example of the cost of this remedy, which, including peasant women at 20 copeks (5d.) a day, and naphtha, of which about 32 cwt. were used, amounted to about 5d. per acre. On the plots that were most thoroughly treated there were no unhatched eggs. The results showed that in these spots there were practically no caterpillars in the spring of 1912, and no damage to the leaves. In the neighbouring plots, which were not smeared, the insects appeared in more or less large quantities, and would have done great damage if the weather conditions had not arrested their development. The author is quite satisfied as to the efficiency of this remedy.

ВАСКІЛОУЗКУ (-). ОТЧЕТЬ О БОРЬБЬ СЪ ВРЕДНЫМИ НАСЪКОМЫМИ ВЪ НУЛЯКОВСКОМЪ ЛЪСНИЧЕСТВЪ ТАМБОВСКОЙ ГУБ. за 1912 годъ. [Report on the fighting of injurious insects in the Kulikov Forest of the Govt. of Tambov in 1912].—«Лъсная мизнь и Хозяйство» ["Focest Life and Economy"].—Тамью, 1913, по. 5, pp. 31-35.

As the result of excavations conducted by Prof. I. K. Tarnani in autumn of 1911, he was satisfied that the year 1912 would be a bad year for Meloloutha on the Kulikov estate, while on the Deinshin estate this was to be expected only on one plot. These expectations proved correct, and the "May beetles" on the former estate appeared in enormous numbers. The author further describes the collection of the beetles organised on about 13,500 acres of the Kulikov estate, and on 12,000 acres of the Demshin estate, which resulted in the accumulation of 15 tons of insects, for which a sum of £200 was paid; 964 people, mostly women and children, were engaged in the work, which lasted from the 2nd June to 6th July. The beginning of field and market garden work, as well as the decrease in the number of flying beetles, led to a gradual diminution in the quantities collected after the 29th June; the amounts brought in varied from 31 cwt. to 14 cwt, per diem before the 16th June, after which date the daily collections were never more than 268 lb., being only 9 lb. on the 23rd of that month. For each pound of live beetles from 3d, to 13d, were paid. The procedure adopted was to shake the trees, when the beetles tell down and were collected in bags, etc. The bags containing the insects were put into boiling water, after which they were emptied into deep pits. In order to check the stench produced by the dead bodies of the beetles, the heaps were sprayed over with lime. It is estimated that at least seven and-a-half millions of females were destroyed.

Some experiments were also started to test the effect of various insecticides, Paris green, barium chloride, and white arsenic, on young seedlings. Underneath some small oak bushes sprayed with Paris green or barium chloride no dead beetles were found, and the insects evidently avoided these plants.

Zhitkov (Gr.). Работы 1912 г. Фащевскаго опытнаго лъсничества по изучению майскаго жука [Studies on Meloloutha in the Fastchevsk experimental forest, Govt. of Tambov, in 1912.] -«Лъсная жизнь и Хозяйство» ["Forest Life and Economy"]. — Tambov, 1913, no. 6, pp. 6-17, no. 7, pp. 4-17, and no. 8, pp. 18-25.

The Fastchevsk forest was formed principally in order to study the best means of fighting Meloloutha, which is the most serious pest of pine forests. In 1912, owing to the cold weather prevailing, the flying of the beetles was noticed only on the 13th May at an air temperature of F4°C. (315°F.) and a soil temperature of 0.2°C. (32.3°F.); on the 14th May the temperature fell again, and not until the 19th May, when the weather became definitely warmer, did the flight in great masses begin. The author describes first the results of the collection of beetles en masse; about 564 poods (181 cwt.) of insects were collected and destroyed. For each pound of insects collected five kopeks (1]d.) were paid, and on some days as many as 24 cwt, were brought in. Only specimens of Meloloutha hippocustani were obtained, in two varieties, one with dark legs and black scutelling (this being in the majority), and another with pale legs and reddish scutellum. No specimens of Meloloutha valgaris were found. With regard to oviposition, observations have shown that the females avoid bare places, though bare fallow is not an absolute protection against oviposition, and that the females dig holes for their eggs in places not exposed to the rays of the sun, the eggs not being able to develop in dry soil. In such exposed places there are no plants, the appearance or smell of which would prevent the female ovipositing near them; rve alone seemed not to be favoured by them.

Experiments conducted to show whether the insects can fly for long distances did not prove conclusive, for no marked beetles were recaptured. The insects are not attracted by light.

The author refers to the statement that white alder grown in nurseries will protect them against the insects, but on one plot on which alders were sown in 1910-11, the insects appeared just as usual. Observations are still required as to how the larvae behave towards the roots of alders, and how it is that this tree withstands their attacks. Experiments as to the effect of various insecticides in protecting the roots of trees from the larvae were made, and Paris green, arsenie, barium chloride, naphthalin and tobacco dust proved harmless to the young seedings, except Paris green, when used in a proportion of more than 3½ drams in 2.7 gallons of water, and naphthalin in a proportion of $\frac{1}{2}$ lb, or more in the same quantity of water. The plots in which the surface of the roots had been poisoned with these insecticides were afterwards artificially infected with larvae of Meloloutha, in one case also those of Scrica, but no damage was noticed in the autumn of 1912; these experiments are to be repeated in 1913. As to the supposed preventive influence of straw and dry oak leaves, the experiments did not prove conclusive, although they produced no evidence against these remedies. The author is not satisfied that birches ought to be excluded from pine plantations; although they no doubt serve as food for the insects, the same applies also to every young tree with tender leaves: -oak, ash, lime, hazel, and sorb. The author contradicts the statement that the collection of the beetles cannot be considered sufficient and effective; he believes that the remedy, if applied, not as an experiment, but on a large scale and everywhere in the Government will yield good results, and that only after several years of such collection will it be possible to judge conclusively as to its efficiency. He further describes the result of digging the earth, in order to ascertain the numbers of eggs, larvae, pupae, and adults wintering in the soil. A table is given showing the result of the examination of 1,625 holes, each one metre square. In July and August the soil was dug out to the depth of I metre; in September and October, to a depth of 11/12 metres. It appears from the table that the collection of beetles was by no means useless, the number of eggs and young larvae in those places where collection was practised being generally less than one-third of that in places where no collections where made; though in both cases an equal number of larvae of older stages (not bred in 1912, but before) were found. Keeping the soil friable decreases the number of larvae; crop-growing on spots where the trees are cut away also gives positive results; in sandy soil the larvae are fewest, next coming pine woods, and then spaces that have been cleared of trees; the heaviest infestation is in soil around deciduous trees; old trees are preferred by the females to younger ones, if both grow together on the same spot; floods from the river Dyuretchka had no influence on the larvae. The author recommends the digging of holes yearly, and on a large scale, to obtain more reliable information as to the present and future occurrence of the beetles.

In conclusion, the author gives an account of various experiments, from which it appears that the larvae require moisture for their development, perishing in dry soil; that they perish in close, compact soil; that in the presence of food in the soil the larvae move about three inches in 24 hours, while in the absence of food the speed is about four inches; some experiments in a special glass apparatus showed that the insects could move as much as two feet in 24 hours. Further observations of this kind are in progress.

К.Т. Вредители и борьба съ ними въ лъсничествахъ Тамбовской губ. въ 1912 г. [Pests and the fighting of them in the forests of the Government of Tambov in 1912].— «Лъсная жизнь и Хозяйство» ["Forest Life and Economy"].—Tambov, 1913, no. 7, pp. 25-28.

The fighting of injurious insects was conducted in 1912 in sixteen forests of the Government, being chiefly directed against the "May beetles" (Melolontha), which are the most widespread and dangerous pests of forests. In nine forests the whole fight was concentrated on the collection and destruction of these beetles, the total quantity of insects destroyed being 25 tons. The insects were mostly killed in boiling water, but in one forest special ovens were dug in the earth. In another forest the beetles were boiled in water to which lime was added, and afterwards used as manure for nurseries for 1913. It was noticed that in one locality where the plantations were eaten totally bare in 1907, the previous flying year, this year they were only partly

damaged. The excavations conducted later proved that in mixed forests, plantations of young oak, birch and aspen, suffered only one-third of the injury done in pure oak plantations, when no collections were made in either. As preventive measures against oviposition by the insects, light harrowing of the soil and spraying of tobacco dust in the nurseries were tried. The latter gave no useful result.

Apart from Melolontha, operations were also directed against Euproctis chrysorrhoea, Lymantria dispur and Lophyrus pini, the larvae of which were collected and destroyed. The larvae of Notodonta trepida were swept by brooms from the trees and collected afterwards into pits. The larvae of Retinia were destroyed by cutting away the branches from the point at which they had started to penetrate, and burning them.

Notice of Public Hearing on the Alligator Pear Weevil (Coleop).— Entom. News, Philadelphia, xvix, no. 9, Nov. 1913, p. 416.

In an editorial note attention is drawn to a meeting that was to be held at the Agricultural Department, Washington, during November, to discuss the question of establishing a quarantine against avocado seeds and fruits imported into the continental United States. It appears that a dangerous enemy to avocados (alligator pears) known as the avocado weevil (Heilipus hairi) exists in Hawaii, Porto Rico, Mexico, and other foreign countries. The weevil lives in the seed of the avocado, and no method is known by which it may be killed without destroying the seed itself. In view of the increase of avocado culture in the United States, especially in California, it is hoped that the nvestigations now being made will lead to the discovery of a method of treatment.

SCHNEIDER-ORELLI (O.). Der gegenwärtige Stand der Reblausforschung. [The present state of research upon Phylloxera.] – Schweiz, Zeits. für Obst-und Weinbau, Frauenfeld, xxii, no. 21, 10th Nov. 1913, pp. 321-325.

This paper gives shortly the work of Börner, which forms a continuation of the researches made recently in Italy and France upon the life-history of the vine louse (Phyllorera rastatrix.) The work upon the subject by Marchal and Feytaud is given fully in the "Revue de Viticulture" (vol. xi, p. 5). The present paper shows that the winged louse and the gall-louse, in the majority of cases, play no part in the spread of the pest on European vines; and that the wingless root-louse can multiply indefinitely, giving rise to numerous generations without the intervention of a sexual generation, as occurs in American vines.

MARCHAL (P.). Contribution à l'étude de la biologie des Chermes. [Contribution to the study of the biology of Chermes.] Ann. Sci. Nat. Zool., Paris, xviii, nos. 3-6, 1913, pp. 153-385, 6 pl., 74 figs.

The author has made numerous observations and experiments to ascertain the life-history of four species of Chermes, viz. C. nusslini,

C. piceae, C. pini, and C. strobi, the host tree of the first two being the fir, and of the last two, the pine. As regards C. nosslini, the author finds that it undergoes an alternation of hosts between Picea orientalis (not P. excelai, as had been held before) and Abies; while C. piceae, which until recently was taken to be the same as C. nasslini, passes its whole life cycle on Abies. Chermes pini was thought to reproduce indefinitely by parthenogenesis on the pine; but sexual reproduction taking place on Picea excelsa, has been discovered by Cholodkovsky. Galls of a species of Chermes, now thought to be C. pini, have been found on Picea orientalis in the south of Europe; recently, in the neighbourhood of Paris where P. orientalis is abundant, the author was able to trace the sexual generation of C. pini on this tree. C. strobi, which has been imported from America, multiplies in Europe exclusively by parthenogenesis.

Bentley (G. M.). Bee-keeping in Tennessee.—Tennessee State Board Entom., Knoxville, Bull. no. 9, June 1913, 64 pp., 56 figs., 2 sketch maps.

This booklet deals very completely with bee-keeping in Tennessee. Bee-moth is stated to be the chief of the troubles of the bee-keeper, which, in diminishing degree of importance, comprise paralysis, foul-brood, ants, cockroaches, toads, mice, and birds. The presence of bee-moth implies carelessness, for it never attacks a strong vigorous colony.

GILLETTE (C. P.) and WELDON (G. P.). The fruit tree leaf-roller in Colorado. Fourth Annual Report of the State Entomologist of Colorado, Fort Collins, Colorado, Circ. no. 7, Sept. 1913, pp. 30-67, 9 figs.

The female moth (Archips araprospila, Walk.) deposits her eggs in compact oval clusters of from twenty-five to more than one hundred. The first larvae emerge with the bursting of the apple leaf buds, and when the blossom buds begin to show their pink colour the eggs are nearly all hatched. The apple is chiefly attacked. Plum, cherry, and pear trees suffer less, and the peach is practically immune; but when food is scarce the larvae will attack any green foliage. The history of the leaf-roller in the Canon City Section is then given by A. S. Taylor. First noticed in the spring of 1908, its ravages rapidly increased, and according to data available in August 1912, the crop on the south side of the river was damaged fully 85 per cent. The north side promised nearly a full crop, but was found to be badly damaged at picking time. The eggs were not destroyed by very strong solutions of lime and sulphur used in 1910 and 1911; 7 lb. of lead arsenate in 100 gallons of water could not save the fruit, though it saved some of the foliage; miscible oil seems to have solved this serious problem at last.

The main report then continues with a comprehensive list of insecticides, tables of the insectary experiments carried out with them, and detailed notes to supplement the tables. These experiments resulted in the following conclusions:—

(1) Leaf-roller eggs possess a remarkable resistance to injury by practically all well-known contact sprays. (2) lime and sulphur preparations, either home-prepared or of commercial manufacture, give little, if any, benefit, even when used in excessive strengths; (3) kerosene emulsion containing 16% per cent, oil, or more, usually kills the eggs, but under certain conditions, which cannot be explained, higher strengths may fail to do so, on the other hand, a weaker strength will often do the work well. (4) a thick coating with a lime whitewash will keep the larvae from emerging from the eggs; it must be sufficient to cover the surface of the egg mass entirely; (5) "Black Leaf 40," "Nicofume," and other tobacco preparations, used alone or with soap, were of no value; (6) strong arsenical sprays used to coat the egg-masses may be of some benefit, but probably not enough to justify their use; (7) whale oil soap, lve, corrosive sublimate, Cooper's "V. Tree Spray," "Aphine," and hydrocyanic acid gas gave little or no protection.

Abundant notes of orchard experiments follow. From them the authors conclude that:

(1) The leaf-roller eggs may be killed by a very thorough spraying with a soluble oil while the trees are dormant, this spray should probably be applied prior to, but as near hatching time of the eggs as possible; (2) very careful and heavy spraying with arsenicals early in the season will result in almost complete control, the first application should be made shortly after the eggs begin to batch, which will be when the first green foliage is showing on the trees, and the second as soon as the blossom buds have separated in the clusters; a blossom spray is, in all probability, not necessary, and is dangerous, in that it poisons the laces. (3) "Black Leaf 40" carefully and thoroughly applied about the same dates as the first two sprayings with arsenicals, will give good results; (4) a mixed spray of "Black Leaf 40" and lead arsenate is little more satisfactory than either one of the insecticides used alone, furthermore, the cost of such spray would be too great for practical purposes; (5) 3 lb, lead arsenate to 50 gals, of water is sufficient for successful control, and there is no advantage to be derived from mixing Paris green with it, as many have done; (6) not less than ten gallons of spray, on an average, should be applied to trees from twelve to twenty years of age; very large trees may require even more; (7) failure to control this pest with arsenicals has been due in most cases either to a failure to spray early enough and at the correct time, or to put enough of the liquid on the trees.

MOORE (H. W. B.). The Planters' Insect Friends, Timehri, Jl. R. Agric, Comm. Soc. Brit. Guiana, iii, no. 1, Sept. 1913, pp. 35-42.

An account of the insect pests which attack sugar-cane in British Guiana and the various parasites which prey upon them. A paper on the same subject by Mr. G. E. Bodkin has recently been noticed in this Review (vol. i, ser. A, p. 439).

BARTHOU (-.). Les Ennemis du Framboisier. [Enemies of the raspherry cane.]—Moniteur d'Horticulture, Paris, xxxvii, no. 21, 10th Nov. 1913, pp. 248-249.

The stem of the raspberry is frequently attacked by the daddy-long-legs (Tipula oleracea). The larva, known as the leather jacket, devours the stem not only of raspberry canes, but of strawberries, vegetables and flowers. Carbon bisulphide may be used as a remedy, also gas-lime. The best method is said to be to collect the larvae in the neighbourhood of the plant. This should be done in the early morning when they come out to feed. Spraying with water and gas-oil emulsion is effectual, but it has the disadvantage of destroying the leaves of the plant.

Another insect attacking the raspberry is Lasioptera obfuscata, Macq., which produces galls on the stems, full of reddish-coloured larvae. The remedy is to cut off and burn the excrescences. The leaves are often attacked by the caterpillars of Polia oleracea, L. The canes should be sprayed at their base with a concentrated solution of sulpho-carbonate of potassium; a trial spray must be made first to ensure that the concentration is not such as to harm the plant.

MOREAU (L.) & VINET (E.). Au sujet de l'emploi des pièges à vin pour capturer les papillons de la Cochylls. [On the use of wine-traps for capturing Clysia ambiguella.]—C. R. Acad. Sci., Paris, clvii, no. 23, 8th Dec. 1913, 1158-1160.

The traps consist of simple glasses, 8 cms. (3.2 inches) deep and 6 cms. (2.4 inches) in diameter at the orifice. They are provided with a plate of glass 9×12 cms., which forms a roof, and which is held above by a piece of iron wire, which serves also to suspend the traps between the vine plants. The liquid consists of wine lees, to which is added vinegar, one part to ten of wine. The glasses are three-quarters filled. The capture of the moths of Clysia by means of these traps is influenced by atmospheric conditions, and does not give, according to the writers, satisfactory results, in spite of the numbers, which show that 2,289 moths were caught in thirty-one traps. It does not appear to constitute a sufficient means of control, and can only be regarded as complementary to other methods.

Thompson (W. R.). Sur la spécificité des Parasites Entomophages. [On the specialised habits of parasites of insects.]—C. R. hebd. Soc. Biol., Paris, lxxv, no. 35, 12th Dec. 1913, pp. 520-521.

The operation of parasites in keeping harmful insects under control has been a considerable asset to agriculturists during the past few years. There is a tendency, however, to attribute to particular parasites too great a power of becoming acclimatised to new surroundings into which they have been artificially introduced, and the author points out that parasites are often sharply restricted to particular hosts. Also, since many undergo an alternation of hosts, the introduction of such parasites into new countries becomes still more complicated.

The author cites a case of two closely allied weevils, which are parasitised by different insects; these are Hypera postica, Gyl., and H. punctata, F. The former is infested by several parasites, among which nine are frequent and easily distinguished; three attack the eggs and six (including a fungus) the larvae and pupae. Hypera punctata, on the contrary, is only parasitised by three species, even when it is in the same fields as H. postica; these three are a Mymarid egg-parasite, a fungus, and an Ichneumon parasite of the larvae. The first two are also parasitic upon H. postica; the last is a specific parasite of H. panetata.

GIRAULT (A. A.). Notes on a Plague of Locusts in North Queensland, and its Relation to Sugar Cane.—Societas Entomologica, Statigart, xxviii, nos. 11 & 12, 31st May and 14th June, 1913, pp. 45-46, 49-50.

Between January and June, 1912, the author made a series of observations upon the locust (Locusta danica) in North Queensland. In January adult specimens were observed in swarms, apparently attracted by the lights in houses. Later in the month, at Innisfail, from the bank of the Johnstone river, quite a large progressive flight was witnessed; in an adjacent sugar plantation most of the plants withered on the next day, the leaves having been stripped of their midribs. In February, the young were noticed, and at the same time many dead adults, mostly females, were found. These were found while ovipositing, with their abdomens half-buried in the earth. These adults were no doubt the last of the migrating swarms observed in January. In March the adults of the first generation were very abundant, and also all larval stages, but in April all had reached maturity. At this time injury to cane was noticeable and rather extensive. In April, eggs of some locust, probably those of L. danica, were found, and an egg-parasite (Sectio oci, Girault M.S.) was reared from them. Later, this parasite, together with another species (Seelio australis, Froggatt), known to be parasitic upon the eggs of L. australis, was found in company with the locusts. In May and June, L. danica were rare, although larvae of australis were seen in colonies.

MARCHAL (P.), Contribution à l'étude de la biologie du Puceron noir de la Betterave. [Contribution to the study of the biology of the Black Aphis of Beetroot.] C. R. hebd. de l'Acad. des Sciences, Paris, clvii, no. 22, 1st Dec. 1913, pp. 1092-1094.

The life-history and occurrence of Aphis comput have been given by Mordwilko. He was of the opinion that this insect, which causes extensive damage to beetroot plantations, had two plant hosts during its life-cycle—the beetroot and Viburnam opulus, L. or Euonymus curopaeus, L., and that by destroying the latter trees in the neighbourhood of beet plantations, the pest could be got rid of. The present author has made further observations at Orleans and at St. Germaindes-Prés, and has found that there are yet other alternative hosts besides the two mentioned above, viz., Fusain de Japon, Rumez, Chenopodium and other wild plants, so that destroying the Viburnum or Euonymus is by no means a sufficient remedy. Moreover, the

author found that in certain cases the insect may complete its lifecycle on one or other of its hosts alone, so that although the pest may be reduced by destroying one of the host plants, it will not necessarily be exterminated altogether.

JARVIS (E.). Notes on the Bean Fly (Agromyza phaseoli).—Queensland Agric, Jl., Brisbane, Feb. 1913, pp. 124-125, & Mar. 1913, pp. 192-195, 2 pl.

French beans in Southern Queensland are subject to the attack of the bean fly, which is widely distributed in the Colony and does considerable damage. The female oviposits in the leaf, and the larva, when hatched, tunnels its way towards the leaf-stalk; pupation takes place in the swollen bases of the leaf-stalks.

Two small hymenopterous insects have been bred from the bean fly in sufficient numbers to suggest that they are doing considerable control work. Regarding artificial remedies, it is recommended to grow a small crop of Canadian Wonder beans to meet the first brood of flies; if found to be harbouring grubs they should be pulled up and burned without delay. All old bean plants that have ceased to be profitable should be rooted up and burned. The stems may be protected by earthing them up. It has been said that good results have been derived from growing beans in a shallow trench and applying to the soil, so as not to touch the plants, whitewash made from acetylene refuse [see this *Review*, ser*, A*, i*, p. 191,] or lime slaked with water containing carbolic acid.

JARVIS (E.). Pumpkin Beetles and how to destroy them. Queensland Agric. Jl., Brisbane, May 1913, pp. 326-333, 2 pl.

Cucurbitaceous plants, which would otherwise do exceedingly well in Southern Queensland, are subject to the attacks of insect enemies, which devour the foliage and flowers and frequently kill both seedings and young plants. The worst of these insects is the Banded Pumpkin Beetle, erroneously called the "Pumpkin Ladybird" (Aulucophora olivieri, Guérin). Although especially partial to the leaves and flowers of cucurbits, they are found on other trees and shrubs, and doubtless have a wide range of food-plants. In 1908 they were recorded as having seriously damaged ripe cherries in New South Wales. They have also been known to destroy apples by biting through the stalks of the young fruit and causing them to fall.

At times they are present in thousands on a single pumpkin plant, a fact not to be attributed, according to the author, to gregarious habits, but to the conspicuous colouring of the beetle itself, which would attract others of its kind. The pest has been recorded in Queensland from various localities in the districts of East Moreton, Wide Bay, Burnett, Darling Downs, Port Curtis, Cook, Warrego, Leichardt, and Burke. In 1907 it was especially harmful in Southern Queensland during November; but the most serious outbreak occurred two years later, when the insect did enormous damage over a wide area of the State.

The eggs, which are yellow and large enough to be plainly visible, are laid on the surface of damp soil or immediately under it among

grass, roots, etc. The egg stage occupies from nine to ten days, the larval stage forty-one days (from 14th March to 24th April). The jupal stage is passed in the soil in an egg-shaped chamber excavated by the larvae at depths varying from one to three inches. Shortly before pupation the larvae are found to be tunnelling the bases of the leaf-stalks and boring the main stem.

Various remedial measures are suggested. The protection of the young plant is very important, as at this stage it is liable, in a few hours, to be greatly injured or even killed by a single beetle. They may be protected by covering them with mosquito-netting until they have begun to grow vigorously. Such covers can be supported by pieces of fencing-wire, bent to the shape of half circles, or more simply by a few short sticks stuck into the ground. The edge of the netting should rest on the earth, and be covered with a layer of soil to prevent displacement by wind, and to stop the beetles from crawling under it. A piece of crumpled paper hung over a young plant and supported by a stick driven into the ground at an angle, is asserted to keep the insects off by its movements in the wind. Plants should be systematically examined in the spring, and any beetles found should be killed by hand-picking. Among chemical substances which may be applied to deter the insects are mentioned the following: (a) refuse of acetylene gas manufacture; (b) ammoniacal gas water; (c) plaster or lime impregnated with turpentine, kerosene or phenyl; (d) tobacco dust; and (e) Vaporite Strawson, "aperite," or other such substance containing naphthalene. These in each case should be sprinkled on the ground around the growing plant, but away from the stem, and only in such amount as to bestow a marked odour upon it.

The following poisons have been advocated from time to time, and have proved more or less serviceable: (a) spraying the leaves with lead assenate (4 lb.) or Paris green and lime ($\frac{1}{4}$ lb, of the arsenical to $\frac{1}{4}$ lb, lime) in every 50 gals, water; (b) dusting the foliage with Paris green (4 lb.) mixed with flour or road dust (20 lb.) or with flowers of sulphur one part) and line (three parts).

When the insects occur in large numbers, it is recommended to shake them from the foliage into shallow pans containing a little water and kerosene. This method is best practised in the early morning or during a spell of cold weather, when the beetles are inactive and less inclined to fly,

In some cases the covering of young seedlings could be avoided by raising the plants in cold frames, so as to get them transplanted and well established before the first beetles appear. Old plants should be pulled up to avoid any possibility of the roots affording food for the larvae.

Other species recorded as damaging cucurbitaceous plants are the Plain Pumpkin Beetle (Adveophora wilsoni, Baly), the Northern Banded Pumpkin Beetle (A. castereti, Guérin), and the 28-spotted Ladybird Beetle (Epilachna 28-punctata, Fabr.) The remedial measures given for A. olivieri apply equally to these insects. Insects Injurious to Papaw Apples in Queensland.—Agric. Jl., Brisbane, July 1913, pp. 33-35.

The following observations were made during July 1913, on insect

injury to papaws :--

In West Cleveland a number of orchards were visited, all showing signs of injury; fine trees had their top leaves drooping and dead, or the main stems defoliated, and carrying a few small discoloured fruits clinging to the blackened crowns. An examination revealed the injury to be due to the presence of the larvae of Dichocrocis punctiferalis, which had bored into the main stem, leaf-stalks and fruit. The same species was further discovered to be injuring oranges and bananas.

The egg is deposited on the leaf-stalk near its point of junction with the main stem, or more rarely on the small fruits. The larva, when hatched, penetrates the hollow stalk and after feeding for a time on its succulent base, bores into the crown, in which it remains until ready to

nupate

Remedial measures must be of a preventive nature, as it is too late to do much good after the larvae have entered the leaves or main stem. The unprofitable food-plants of the species should be destroyed in the vicinity of the orchard, but on the other hand they should be encouraged in other parts. Spraying papaws with arsenate of lead (1 lb. to 50 gals. water) would poison newly-hatched larvae attempting to enter the plant; this should be done just before the eggs are laid, and directed principally against the early broods. All infested fruit such as peaches, etc., should be gathered and destroyed.

The food-plants of the insect already recorded are the peach, papaw, orange, loquat, guava, custard apple, granadilla, banana, millet, maize, cassia, senna bean, Canavallia indica, dahlia, and castor-oil plant.

Annual Report of the Bee-Keepers' Association of the Province of Ontario, 1912.—Ontaria Dept. Agric., Toronto, 1913, pp. 72.

The various papers read at the annual meeting on November 13th, 14th and 15th, 1912, include such subjects as Federal Legislation regarding bee diseases; inspection of apiaries in Ontario; management of outlying apiaries; moving outfit on motor truck; preparing bees for outdoor wintering; cellar wintering and spring management; bees, poultry, and fruit; bee-breeding.

FULLAWAY (D. T.). A New Species of Mealy-bug Parasite (Aphycus terryi): -Proc. Hawaiian Entom. Soc. 1911-1912, Honolulu, ii, no. 5, July 1913, p. 281.

The new parasite described was bred from *Pseudococcus saccharifolia* at Olowalu and Hana, Maui, by F. W. Terry, June 1909, and at Hilo, Hawaii, August 1912, by O. H. Swezey.

WILSON (H. F.). Combination sprays and recent insecticide investigations.—Proc. Entom. Soc. Br. Columbia, Victoria, B.C., no. 3, N.S., 1913, pp. 9-17.

Details and results of spraying experiments are given in this paper.

The author states that the factors which led to the study of the subject are:—(1) It is the most important problem before the farmers and fruit-growers of to-day; (2) for some one or more reasons not clear to us, our knowledge of sprays and their effects is very unsatisfactory; (3) while our commercial insecticides are more or less stable under certain ideal conditions, the results obtained from their use are too variable for us to make definite regulations; (4) the economy of spraying and the numerous new sprays on the market at the present time demand an entirely new investigation of the subject.

The results are summarised as follows: Arsenite of zinc acts more quickly, and remains in suspension better than arsenate of lead, acid or non-acid; acid arsenate of lead was superior in these respects to the non-acid; the non-acid is slow, but finally kills; lime-sulphur did not prove of much value as a stomach poison, and when mixed with arsenicals seems to retard their action; lime-sulphur probably acts as a repellent to biting insects as Bordeaux mixture does against the potato flea-beetle; very young caterpillars placed on twigs which had been sprayed with lime-sulphur did not feed, and eventually died; half-grown larvae did feed to some extent, and when transferred to unsprayed twigs developed normally.

Winslow (R. M.). The Economic side of Pest-Control. Proc. Enton. Soc. Br. Columbia, Victoria, B.C., no. 3, N.S., 1913, pp. 17-21.

For the Province, expenditure on the control of pests for 1913 is estimated at 21,000 dollars for material, 20,000 for application, and 12,500 for 25 per cent, of equipment costs.

The paper also embodies a report on the cost of manufacturing hime-sulphur at Okanagan. With material at wholesale prices and freight at car-load rates, the commercial article delivered at Okanagan Points costs about £2.7s. per 40 gallon barrel of £25 lbs. Provided the same conditions obtain, the cost of manufacturing at Okanagan is about £1.0s. 10d. When buying material in less than car-load lots it would rise to £1.8s. 10d. approximately. There would be, in addition, the cost of a hydrometer (4s. 2d.), and the first cost of the boiling plant, which on a one-barrel scale need not be over £2.9s. 5d., and might be kept as low as 12s. 6d. or 16s. 8d. The product should test about 20° Beaumé, that is, not quite so strong as the commercial one which tests 32½° Beaumé. Under proper conditions several dollars per barrel might be saved; but on the small scale, especially with inexperience, the saving would be more apparent than real.

TREHERNE (R. C.). Methods of taking insect records in the field.
—Proc. Entom. Soc. Br. Columbia, Victoria, B.C., no. 3, N.S., 1913, pp. 21-24.

Without claiming originality, the author puts forward several suggestions he has found useful. To determine percentage of infestation: select 5 typical locations in the field to be examined, and from them a typical row, tree, or plant to be inspected. Then count 50 plants, buds, fruit, or leaves, as desired, and examine carefully for

injury. Then the total number of injurious marks, divided by the total number of objects examined, multiplied by 100, gives the percentage of infestation. If it is wished to follow the observations by others during the same season, to observe the progress of infestation, stakes or markers should be used, so that the same area or ground is covered each time. Tables are given for estimating egg, larval, or adult abundance to an acre, and for making estimates on nursery stock rows, gooseberries, currants, raspberries, or such like bush-fruits, and for use with trees set on the square-planting plan, corn-hills and tomato plants. These methods may prove of practical use to the working field inspector.

RUHMAN (M. H.). The importance of Economic Entomology as a Subject of Education. Proc. Entom. Soc. Br. Columbia, Victoria. B.C., no. 3, N.S., 1913, pp. 27-28.

It is stated that 50 per cent, of the insect pests of the United States are introduced species. The very rigid inspection of nursery stock, plants, and fruit enforced in Canada, makes it almost impossible for insect pests to be introduced through these channels, but the tradesman may leave the packing material of imported products lying about, and farmers and fruit-growers do likewise. Most of the latter have not the elementary knowledge and power of observation to make the best use of the advice now obtainable concerning the control of pests.

DAY (G. O.). President's Address. Proc. Entom. Soc. Br. Columbia. Victoria, B.C., no. 3, N.S., 1913, pp. 29-30.

Stress is laid on the importance of Systematic Entomology in this address, the speaker pleading for the amalgamation of the economic and systematic sides of the subject.

PALMER (L. L.). Some problems in Aphis-control.—Proc. Entom. Soc. Br. Columbia, Victoria, B.C., no. 3, N.S., 1913, pp. 31-34.

There is not a single operation in the proper care of orchards that may not influence the fruit produced, and no fruit-grower can afford to allow any insect pest which, directly or indirectly, injures the quality of the product, to go uncontrolled. If the cost of production is too high, the grower must reduce it, not by neglect of any single operation, but by making one operation aid another, by more thorough work in fewer operations. In dealing with orchards infested with woolly and green apple-aphis and scale insects, it is possible to work so thoroughly as to kill the one which is doing the most damage, or the two which are of greatest economic importance, and also very effectually check the third. For instance, a spray of 1 part concentrated lime-sulphur in 9 parts water, with the addition of 1 part Black Leaf 40 to every 800 parts of solution, applied with a power sprayer and a pressure of at least 175 lb., previous to the opening of the leaf-buds in early spring, should kill all over-winter woolly aphis above ground. as well as oyster-shell scale, when thoroughly brought in contact with

the insects: but it will not destroy all the green apple aphis eggs. For green apple-aphis 1 part lime-sulphur concentrate in 30 parts water, with 1 part Black Leaf 40 to every 900 parts solution, should be applied after the leaf-bads have just opened, and will effectually kill the greater part. An application of a 15 per cent, solution of kerosene emulsion, or Black Leaf 40, 1 part to 900, about the 10th to 15th of September, in Vernon District, will free the tree-tops of woodly apple-aphis previous to the appearance of the winged viviparous females, which probably migrate to other host plants, beyond control.

Furthermore, the author recommends ploughing a furrow on each side of the trees in the spring or early autumn. A man follows up, and with a large digger hoe, or shovel, exposes as much of crown and roots as possible within a 4-foot radius of the tree; then sprays thoroughly with kerosene emulsion, forcing the spray well into the soil about the crown and base of the tree. As the ploughing is necessary every other year, advantage is thus taken of it to make the spraying more effective. Again, by arranging to prune the trees from 1 to 4 years old in late winter or early spring, the shining black eggs of the green apple-aphis are then easily seen, and can be clipped off in the regular pruning operation. By pruning in late winter the exposure of immature wood to the cold winter weather is also avoided.

LYNE (W. H.). Two injurious insects of economic importance attacking peach, apricot, and plum trees. Proc. Entom. Soc. Br. Columbia, Victoria, B.C., no. 3, N.S., 1913, pp. 34-36.

The method of control adopted for the peach twig-borer (Anaesia lineatella) consists of winter spraying with lime-sulphur 1 10, just as the buds are opening, and arsenate of lead 3 lb, to 50 galls, of water when the new growth starts. To protect the fruit from the second brood of larvae, use the arsenate spray just about the time the moths begin to fly by the middle of July in British Columbia. In dealing with the peach root-borer (Sanninoidea exitiosa, opalescens) it is best •to cut the larvae out about the end of June before they pupate. Before replacing the earth round the tree the following wash should be applied: I part lime-sulphur to 6 parts water, with enough freshslaked lime to thicken 5 gallons of the mixture to a good thick paint; into this stir thoroughly 1 lb, whale-oil soap and 1 pint carbolic acid or I lb, coal tar. When the paint has had time to dry on the trees, replace the earth, banking up 4 or 5 inches. This wash will also protect from fungous rot, etc., besides making it very difficult for the young larvae to penetrate. To save cutting, fumigation of the roots with carbon bisulphide has been resorted to, but is not popular, as there is danger of killing the tree. The peach root-horer is a most injurious pest, on account of its deadly work being done unseen in the most vital part. Its presence is often not suspected until the tree dies, after the crown of the roots has been successfully girdled.

MIDDLETON (M. S.). Cutworms and their control. "Proc. Entom. Soc. Br. Columbia, Victoria, B.C., no. 3, N.S., 1913, pp. 36-37.

It would seem that epidemics of insect pests are followed by periods of comparative rest, due almost wholly to parasitic control. The

latter is considered to have checked the epidemic of cutworms prevalent in 1912 in the Kootenay, for but little damage resulted in 1913. The pests injured nearly every cultivated plant, including green grain. Vegetable gardens and orchards suffered most, while they were very destructive in cabbage, turnips, and tomato fields, and damaged strawberry beds extensively. The most common varieties are the red-backed (Paragrotis ochrogaster), the greasy (Agrotis ypsilon), the variegated (Peridroma saucia, Lycophotia margaritosa), and the zebra caterpillars (Mamestra canadensis, Polia nevadae). The Canadian list might be extended to include the following: yellow-headed (Hadena arctica, Aplectoides speciosa), spotted (Noctua c-nigrum), brown (Nephelades minians), W-marked (Noctua clandestina, unicolor), common striped (Euroatessellata), white climbing (Carneades [Lycophotia] scandens), spotted legged (Porosagrotis vetusta), and dingy (Feltia subjothica). Poison bait is possibly the best all-round material for control. Use 1 lb. Paris green, 50 lb. bran, about 3 lb. sugar. First moisten the bran a little, then add the Paris green and mix well, then add the sugar as sweetened water. The bait should be considerably sweeter than the plants the larvae are feeding on. About 25-50 lb. should suffice for an acre of vegetables and fruit. Fruit trees only will require much less. Keep the mixture well away from the trees or plants to prevent them from being injured. Tanglefoot has given good results in the case of fruit trees and larger plants, and banding with cotton batten is also useful. Running chickens are very effective in an orchard. Cultivation methods assist considerably. Cover crops left over winter as a protection harbour the larvae, the eggs of which might be destroyed if the sowing of the crop were delayed a little to allow of this.

TAYLOR (L. E.). Economic Ornithology,—Proc. Entom. Soc. Br. Columbia, Victoria, B.C., no. 3, N.S., 1913, pp. 37-41.

The author summarises his remarks by stating that there is a chance of imported birds becoming a pest and upsetting the balance of nature, and that scientific societies should protest against permission being granted for the introduction of any exotic birds into the country, either from aesthetic or economic considerations. At the close of the ensuing discussion it was moved and seconded, "That this Society, in view of recent researches into the economic value of introduced birds in other countries, disapproves of the practice of granting permits for the introduction of any exotic birds into this province." This was carried manimously.

SWAINE (J. M.). The economic importance of Canadian Ipidae [Scolytidae.] - Proc. Entom. Soc. Br. Columbia, Victoria, B.C., no. 3, N.S., 1913, pp. 41-43.

The genus *Dendractorus* contains a number of species most injurious to conifers; *D. piccaperda*, Hopk, has killed an immense amount of the finest spruce timber in Maine and New Brunswick. *D. valens*, Lec., is commonly found in dying bark of spruce and pine logs, and not rarely is the primary cause of the death of the trees. In British

Columbia it is assisting D. breviconcis in killing bull-pine. An undescribed species of Dendroctonus breeds in the fire-injured timber of Manitoba, and has killed jack-pine, mostly near the burns. D. simpler breeds in dving larch-bark from Manitoba eastward, and apparently kills many trees weakened by the larch sawfly. Another undescribed Dendroctonus, assisted by species of the genus 1ps (Tonicus), is apparently killing much white spruce along the Athabaska river. D. pseudotsugue, Hopk., everywhere kills injured and weakened trees, and frequently much green timber. D. montwolac, Hopk., has killed many western white pines (Pinus monticola) in the Sugar Lake region of British Columbia, and the outbreak is still spreading. It also kills the black pine there. D. engelmanni, D. borealis, D. murrayanae, and D. obesies are variably destructive to spruce and pine in the Province. Many species of genus Ips (Tomicus) are abundant in dying bark of pine, spruce, and larch. They are mostly secondary enemies, seldom attacking green timber. Some species, however, are injurious to pine and sprace in British Columbia and Alberta, and Insbalsameus, Lec., is a serious enemy to balsam fir throughout Ontario, Quebec, and New Brunswick, also injuring larch to a lesser degree, Polygraphus cofipennis, Kirby, and allied undescribed forms are everywhere important secondary enemies to pine, spruce, and larch. Several species of Phlocosinus are locally injurious to cedars. Certain twig beetles of the genus Pityophthocus at times become sufficiently numerous to check and, rarely, kill the infested trees. Such injury was abundant on jack-pine in northern Ontario, and bull pine in British Columbia. Belonging to this group are the peach-tree bark-beetle (Phlocotribus liminaris) and the fruit-tree bark-beetle (Eccoptogaster ragulosus) which are important pests in southern Ontario, and the former breeds also in the wild cherry in Quebec Province. The clover bark-beetle (Hylastinus obscurus, Marsh.) is injurious to red mammoth, alsike and crimson clovers in parts of Quebec and Ontario. The deciduous trees of Canadian forests suffer less from this family. Ambrosiabretles, do not, as a rule, attack sound timber; in British Columbia cheir injury is only noticed in felled timber left out of water, or in fireminred trees.

P. F. Die Bekämpfung des Heu- und Sauerwurms mit Nikotin während des Jahres 1913. [The use of nicotin against the vine moth in 1913.] Laxemburger Weinzeitung, Grevenmacher, i, no. 29, 1st Nov. 1913, pp. 499-506.

A Bordeaux mixture was used, and to it were added $1\frac{1}{2}$ parts soap jelly and $1\frac{1}{2}$ parts of Evert's tobacco extract $(10^o, o)$ per 100 parts spray. Fight reports were dealt with. Three stated there was no foreign aste in the must, two reported a bad taste, and the remaining three a very had one. Too strong a percentage of nicotin $(4^o, o)$, and in one ase the admixture of casein, are supposed to account for this. Several experimenters suggested that the copper was the cause and not the nicotin. Particular stress is laid on the fact that the successful use of soisons can only be expected when the vineyard is at the same time fliciently protected against Oidiom and Peronospora. Nicotin is most idvantageously employed when the flight of the moths is at its height.

Spraying must be carefully and thoroughly carried out, otherwise it is best not to incur a useless outlay. Nicotin will keep for years if packed in air-tight containers.

WILLIAMS (B. S.). Hadena oleracea destructive to Tomatoes.—Entomologist, London, xlvi, Dec. 1913, p. 333.

In a short note, attention is drawn to the fact that *Polia (Hadena)* oleracea, L., has done great injury to tomatoes all over England. The only remedy seems to be to collect the larvae by hand, and to take off the top layer of soil, when the insects are in the pupal stage, and burn it, both of which processes involve considerable labour. Being under glass, the insects are protected from birds, and apparently from parasites also. Funnigation had not been tried.

FRIEDRICHS (K.). Ueber den gegenwärtigen Stand des Bekämfung des Nashornkäfers (Oryctes rhinoceros, L.) in Samoa. [On the present state of the campaign against the Rhinoceros Beetle in Samoa.] Der Tropenpflanzer, Berlin, xvii, nos. 10, 11, 12, Oct-Nov.-Dec. 1913, pp. 538-558, 603-619, 660-675, 19 figs., 2 sketch-maps.

The prosperity of Samoa is so largely dependent on the coconut palm that the control of the Rhinoceros Beetle constitutes a problem of the very highest importance. Where the Government has taken immediate and energetic measures, the pest has been reduced, but on the whole there has been an increase. The planting district around Apia has suffered most, as the beetle has undisturbed opportunities for breeding in the cacao and Hevea plantations, and the coconut palms being there comparatively few in number, serve as an attraction for countless beetles. The coast belt, being owned mostly by natives, who prosecute weekly searches, does not suffer so much.

The direction in which the pest spreads is generally determined by the prevailing wind. It was introduced with Heven plants brought to Apia from Ceylon, and traces of its ravages were first noticed in 1910. On the east coast the damage is not very apparent, but the trade winds on the west coast have caused a rapid spread. The bush palm (Cyphokentia sumoensis, Warb.) also provides the insects with food, but it is not feasible to combat the pest in the bush.

Protection of the Palms. Vosseler says that coarse-grained sand keeps off the beetle. This may be useful in the angles of the leaves, but does not protect the yet unopened leaves, which suffer most. Labour charges would also be heavy, as it is necessary to climb the palms in order to apply the sand. The tropical rains will also soon wash it away: experiments are being made with tar, as a protection for the young leaves, but it seems possible that it may prove injurious to the plants. Should a mixture of tar $(\frac{2}{3})$ and petroleum $(\frac{1}{3})$ reach the growing point through a bore-hole, it will kill the palm. Though this mixture was considered to be excellent by a local planter, the author saw numerous trees destroyed in this way on one plantation. It has not yet been ascertained if tar alone acts in this way.

Control by Collection. In the early morning, workers provided with a metal case and heavy knife search all rotten wood, heaps of leaves, etc., which may harbour the beetles. Every native must bring in a minimum number fixed by the village chief. About 9 o'clock the count is made and destruction effected by fire or boiling water. At the present time this collecting is the most efficacious measure. But the natives often render it illusory, either by gathering in special likely places instead of on their own plantations, or by robbing the trapheaps got together by the Government workers. Also they probably breed beetles for the purpose. But in spite of this, collecting remains a valuable aid.

Decoy Methods. Light has been used, but without much success. The author thinks it is only useful as an aid to other decoy methods. He has also experimented with toddy, but cannot report favourably on its usefulness as a means of attracting the beetles.

Trap heaps were employed as soon as the pest appeared, and much money was expended on them. Groups of 10 to 20 natives, under white supervision, erect heaps of old wood (especially pieces of palm trunk), leaves (especially of the banana), and earth. The lower part of the pile is in a trough, the upper part stands above the soil level. The total height is about 20 inches, generally less. Smaller heaps composed of leaves only have been used, but are being abandoned, as the natives turn them over. Cacao pods are buried in some plantations and make good traps. The heaps are turned over every six or eight weeks. This frequent search ensures the discovery of nearly every larva. Both females and males are found in these heaps, of 1,900 captured beetles 566 were females and 434 males, but the proportion varies considerably.

At present there are about 600 heaps, and in 1912, 11,300 beetles, 220 pupue, nearly 776,000 larvae and over 180,000 eggs were collected. In round figures, about a million pests were caught at a cost of 28,000 marks (£1,400), which works out at a little over 1 farthing each.

The author is of opinion that at present this method is as useful and as necessary as in the past. It has been shown that the application of carbon bisulphide to the heaps is effective, and the poison need only be used every 3 months; the cost would be less than that of digging up the heaps.

Besides carbon bisulphide a number of other substances were tried. Saltpetre gave really good results. It can be used with buried cacnopods; garden beds can be manned with it; trap heaps—which are no longer required as such—can be treated with it; it can be used on tree-trunks and roots.

Removal of breeding places. This is a most important measure. Dead palm-wood is always dangerous, and by boring a hole in the trunk and filling it with saltpetre, the latter will gradually permeate the wood. How long this action will be useful is still an open question. It is quite clear that by careful cleaning of the plantations the pest can be reduced.

Natural enemies. One of the reasons for the spread of the pest in these islands is the lack of natural enemies. The semi-wild pigs of the natives are not at all to be despised in this respect, and are already used for this purpose. Attempts have been made to introduce the

mole (Talpa europaea), but it is difficult to do so. Hedgehogs soon succumbed to the climate. Fowls and other birds are not of much use.

The author examines at length the question of parasites, and comes to the conclusion that parasitic wasps appear to be of greater importance than all the other cnemies of this beetle. He mentions, amongst others, Scolia carnifex, Coq., and Scolia oryctophaga, Coq., as apparently specially suitable, if their introduction can be effected on a large scale.

But all animal enemies appear to yield in importance to a parasitic fungus (Metarrhizium anisopliae), which occurs in the islands, and evidently has other hosts besides the Rhinoceros Beetle. When the author first had a large number of larvae delivered to him, he noticed brown spots on some of them. Having isolated these, they died in about a week and became completely covered with this fungus. Healthy larvae were brought in contact with the bodies, and all succumbed. Practically all the larvae in the laboratory became infected, and died. The fungus thrives best in moderately damp cultures. A trap heap of leaves and rubbish infected with the fungus, has conserved its deadly powers for several months, up to the time of writing, and has been fatal to every brood in it. The fungus does not prevent the beetles from laving their eggs there, which is a most important point. The fungus also spreads in the neighbourhood of the heap. Experiments have proved that the flying beetles can carry it to other breeding grounds. As the thoroughly infected heaps would only require a simple examination once every 3 months (later on once every 6 months), the number of heaps could be increased tenfold. The best method is to use cacao pods buried under a layer of earth. Quite fresh pods should not be used. The fungus is already in satisfactory use on the plantations, and planters have begun to assist its spread. A lengthy bibliography of pests of the coconut concludes the paper.

VON GRAUMNITZ (C.). Die Blattschneider-Ameisen Südamerikas. [Leaf-cutting Ants of S. America.] - Internat. Entom. Zeits., Guben, vii, no. 35, 29th Nov. 1913, p. 233, & no. 36, 6th Dec. 1913, pp. 240-242.

The leaf-cutting ants, Atta discipera, A. coronata and A. hystrix, are very prevalent in parts of Brazil. The present paper gives a description of their leaf-cutting habits and the structure of their nests. The trees which they most persistently attack are the orange and peach, and in the vegetable garden, the cabbage and allied plants; they attack also ripe bananas, maize, rice, etc. They do not use the leaves directly as food, but allow them to rot and thus produce a favourable medium for the growth of the fungus, Rozites gongylophora, which is their staple article of diet. The nests are underground, and are built on a very complicated and ingenious plan; the eggs are laid in the decaying leaves, which form a large porous mass in the nest, rather like a sponge. In this mass are found eggs, larvae, and pupae in all stages of development; the fungus growing on the leaves serves as food material for the larvae as well as for the adult ants. The ants cultivate this particular fungus very carefully, destroying any other kinds of fungi which make their appearance. It is quite common to find snakes' eggs amongst the leaves; the warmth given out by the decomposing mass makes it a suitable place for this purpose; among others, the eggs of Elaps corallinus have been identified.

Ruggles (A. G.). Notes on a Chestnut-tree Parasite. Science Philadelphia, xxxxiii, no. 989, 12th Dec. 1913, p. 852.

While working in connection with the Pennsylvania Chestnut Tree Blight Commission last winter, the author noticed numerous burrows which were almost always present in the bark of the chestnuts, particularly in the smooth-barked trees. He was satisfied that the bur rows were not the work of Agrilus bilineatus, as had been suggested by Metcalf and Collins in the U.S. Farmers' Bulletin, No. 467. eventually proved to be due to the larvae of a small moth, which hiher nate in the burrows in either the second or third instar, finished, the burrow is not very extensive, the longest being not more than six inches, and extending longitudinally. While the insect is within the trees the burrow cannot be detected externally. After the emergence of the larva, however, the bark swells over the burrow, often cracking and making a conspicuous wound. The larvae leave the trees during the first part of June through minute exit holes, dropping to the soil, in which they spin a seed-pod-like cocoon, characteristic of some of the Microlepidoptera. The single perfect insect obtained was in too injured a condition to be identified. The number of exit holes made by these insects is enormous in any given area of chestnut forest, and as these holes are made just at the time when the blight spores are very abundant, and conditions generally are fayour able for their development, it is believed that this insect has an important bearing upon the spread of the chestnut blight, Eudothiu parasitica,

DOANE (R. W.). The Rhinoceros Beetle (Orgetes Rhinoceros, L.) in Samoa. Jl. Econ. Entom., Concord. vi. no. 6, Dec. 1913, pp. 437-442, 2 pl.

The Rhinoceros Beetle, Orgetes rhinoceros, L., has long been known as a more or less serious pest of eccount trees in many tropical countries. It is gradually extending its range, and wherever it gains a foothold in a new country its ravages usually cause great financial loss. The island of Upolo, German Samoa, is one of the recent places to suffer from the introduction of this pest. In districts where the infestation is worst, hundreds of trees are being killed on many of the plantations, and many others badly injured. As the beetles attack the most vital part, the succulent crown, one or two will quickly kill a young tree. Older trees are better able to withstand attack, but even a few beetles in them will soon make them unproductive. The beetles usually attack the tree between the base of a leaf and the trunk, or between the bases of two leaves. Having reached the tender heart of the tree, the beetles feed on it, probably for some weeks, often destroying much or all of it, thus killing the tree.

The life-history of the insect has not been thoroughly worked out, but in Samoa it probably takes a year to complete its development. The eggs, which are laid in batches of 10-30, batch in a very short time, and the larvae feed for several weeks, possibly for some months.

The pupae are rarely seen, and never in considerable numbers; many of the larvae probably pupate at some distance below the surface of the ground. The pupal stage lasts for about 10 days to a fortnight.

In Samoa many control methods have been tried. In the author's opinion, tar is the most valuable repellent, but its use gives only a small measure of protection. Trees treated with lysol, or lysol mixed with tar, continued to be badly injured. Sand was poured into the crowns of a few trees, and on others a mixture of sand and arsenic, care being taken that plenty lodged at the bases of all the leaves. The arsenic injured the leaves; otherwise the trees were not badly attacked, but there was not sufficient time to test this method thoroughly. Dusting with white arsenic, Paris green, etc., is not satisfactory, owing to the fact that the beetles do not swallow the leaves or fibre. Pouring carbon bisulphide into the holes made by the beetles, killed the beetles, but also injured the tree. Bait traps, if carefully prepared, are quite effective on well-cleaned plantations, but they are expensive and require close supervision. For the present, the most effective method is to destroy the breeding places of the beetle by removing all decaying logs, etc., from the plantation. [See above, pp. 26-28.1

WOLCOTT (G. N.). Report on a Trip to Demerara, Trinidad and Barbados during the Winter of 1913. Jl. Econ. Entom., Concord, vi. no. 6, Dec. 1913, pp. 443-457.

In Demerara the small moth-borer (Diatraca saccharalis, F.), and the closely allied species, D. lincolata, Walk., and D. canella, Hmp., are the most serious pests of cane. On nearly every estate there are gangs of boys, sometimes as many as 50 in a gang, who do nothing else the year round but cut out the dead hearts killed by the Diatraca larvae. It shows how serious the pest is that the boys have no difficulty in collecting 700 larvae day after day. The problem of controlling Diatraea is most seriously complicated by the dry and wet seasons. There are always two, and sometimes four, wet seasons and as many dry. Cane is cut towards the end of each dry season, and seed cane is planted at each wet season. A crop takes 18 months to mature, so that caue in all stages of growth is present on a single estate at all times. Moths will fly out a hundred vards or more from the older cane and deposit eggs on the young cane from which all the dead hearts have just been cut out, and in a few weeks the infestation will be as heavy as if no control had been attempted. In Demerara there are four insect parasites of Diatraea, but in spite of these, and of the artificial control, Diatraea still remains a serious pest. The one measure that can be adopted is the simultaneous planting of enormous blocks of cane; it is the indiscriminate scattering of the fields of all ages of cane on an estate that makes possible the rapid and easy infestation of young cane.

The only other serious cane pest in Demerara is the giant mothhorer (Castnia licus, F.). The larva enters the cane near the ground and burrows down into the root and up into the stalk. There are fortunately several practical methods of control. They are as follows: (1) Collecting the adult moths in butterfly nets; (2) cutting out the young larvae in the young ration cane; (3) cutting out the older harvase and pupae from the stools of cane after the crop has been harvested; (4) in the case of very heavy infestation, the flooding of the entire field after the cane is cut.

Much cane is also injured by termites; they never attack sound cane, but as all the cane in Demerara is infested with Diatraca, the termites have no difficulty in finding a place of entrance into the interior of the stalk. The method of control adopted consists of carrying the nests away and burning them. The sugar-cane mealy bug iPseudococcus calceolariae, Mask.), was moderately abundant, but it is not considered a serious pest; it is kept in check by a predaceous beetle, the name of which has not been determined.* [See this Review, Ser. A. i, p. 521.]

In Trinidad the most injurious pest is not *Diatraca*, as it is in practi cally all other sugar-producing countries of the West Indies, but a troghopper (Tomaspis varia, F. [saccharina, Dist.]). It passes through its larval stages underground, feeding upon the roots of cane, grass and weeds: the adult sucks juice from the leaves and stalk of the cane, but produces no serious injury.† Despite the small size of the nymphs, the enormous numbers in which they appear on the roots of the cane, either kill the cane outright, or so stunt the growth that the crop is worthless. The control of this pest is rendered the more difficult because of the lack of vulnerable places in its life-history. As all ordinary methods of control are impracticable a novel plan of campaign has been adopted. This depends on the circumstance that the fungus Metarchizium anisophiae, Sorokin, produces a fatal disease among froghoppers called Green Muscardine. Planters cultivate this fungus, and at certain seasons dust its spores over the entire fields; although this method is of too recent origin to have borne the test of time, it is already stated that in one examination made by Mr. Urich, where spores had been applied early, at least 95 per cent, of the nymphs in the stool of the cane were found dead and covered with the characteristic spore-masses of Metarrhiciam, Castolus plagiaticollis, an efficient predator on the adult froghopper, has been imported from Mexico. Two Chalcidid parasites have been bred by Mr. Guppy, Mr. Urich's assistant. Castain liens does great injury to canes in Trinidad. The only practicable method of control is the catching of the adults with butterfly nets; this has produced good results. Among the more important minor pests are the weevil stalk-borer (Mctamasius homipterus, var. decoloratus, Gyl.), the "grn-grn" worm (Rhyncophorus polymerum, L.) and the sugar-cane mealy bug (Pseudococcus calceolarine, Mask.)

In Barbados the froghopper and the larger moth-borer are absent, but otherwise the insect pests are similar. Diatraca does an enormous amount of injury; both kinds of the sugar-cane mealy bugs (Pseudococrus culceolariae, Mask., and P. sacchari, Ckll.) are abundant. Delphar succharicora, Westw., the sugar-cane leafhopper, and Metamasius hemipterus, L., the weevil stalk-borer, also do considerable damage. With the exception of Diatraca, however, all these are minor pests in

Hyperaspis trilineata, Muls.—E.D.] iqThis view is disputed by Mr. J. C. Kershaw, who has just devoted per to the special study of this insect.—ED.]

^{*¡}Specimens of this Coccinellid, sent by Mr. G. E. Bodkin, from Demerara, and by Mr. J. R. Bovell, from Barbados, have now been identified as Hyperasis trilineata. Muls.—Ep. 1

comparison with the injury produced by the weevil root-borer (Diaprepes abbreviatus, L.) No effective method of control is known, but the numbers of the grubs can be considerably reduced by handpicking of the adults, which collect in large numbers on corn and sorghum. The insect eats most of the small roots and chews the centre out of the main tap-root. As regards Diatraea, Trichogramma minutum is its only parasite in Barbados. Another interesting pest, from the point of view of those interested in parasitism, is Phylalus smithi, which is parasitised by a black Scoliid wasp, Tiphia parallela, Smith. P. smithi occurs also in Mauritius; it was probably introduced there in cane sent from Barbados. Until now the controlling parasite, T. parallela, was not present in Mauritius, but efforts are being made to import it.

WILSON (H. F.). Notes on Podabrus pruinosus, -Jl. Econ. Entom., Concord, vi, no. 6, Dec. 1913, pp. 443-457, 1 fig.

This insect is one of the most important agents in the control of all forms of plant lice. It has been very abundant in the Willamette Valley, Oregon, during the past two years. The rosy apple aphis (Aphis sorbi, Kalt.!), the black cherry aphis (Myzis cerasi, F.), and the vetch aphis (Maccasiphina pisi, Kalt.!) are held in check by this insect. The adults appear early in May, and are abundant by June. By July only a few individuals are found. They are commonly found in vetch fields, and in the rolls of infested apple and cherry leaves. They undoubtedly destroy many aphids in a day, and are of great economic value.

The eggs were not observed in the field, but in the insectary they were deposited on the ground in masses. The larvae are found in the ground from 3-6 inches below the surface; they are pink in colour and covered with fine hairs. The pupae are found in earthen cells in the moist earth; at first they are white, then they change to pink, and then to dark blue. The adults are dark blue with light brown markings.

HINDS (W. E.). Powdered Arsenate of Lead as an Insecticide. Jl. Econ. Entow., Concord., vi. no. 6, Dec. 1913, pp. 477-479.

The use of powdered arsenate of lead is said to have given very satisfactory results as an insecticide; the statement is the result of experience, and direct experiment made in the Agricultural Experiment Station at Auburn, Alabama. It has the advantage over the paste preparation in that it weighs much less, and, therefore, the cost of transport is less; it is not liable to harden and cake, as the paste is: and it is not so difficult to work up into a uniform suspension in water for spraying. Over Paris green it possesses the great advantage of not causing skin injury to the men using it. The Department of Entomology of the Alabama Experiment Station is now making an investigation covering the use of various forms of arsenate of lead. with a view to finding exactly what form is most effective, economical and generally satisfactory for use against various insect pests. For the present there is no reason why anyone should hesitate to use powdered arsenate of lead in preference to Paris green or any other arsenical poison.

FELT (E. P.). Arthrochodax carolina, n. sp.—Jl. Econ. Entom., Concord, vi, no. 6, Dec. 1913, pp. 488-489.

Mr. E. A. MacGregor, who reared this species both in 1912 and 1913 from red spiders on cotton, is of opinion that it is the most important natural agent in controlling this pest. The new species is allied to A. apiphila, Felt, and is distinct from A. occidentalis, Felt, which is recorded as preying upon red spiders in California.

Amendment to "The Destructive Insect and Pest Act of Canada."

In line 14 of Regulation 3, the words "Importations by mail shall be subject to the same Regulations," have been deleted, and a new Regulation, No. 18, has been added, reading:—

"18.—The importation of all nursery stock, including trees, shrubs, plants, vines, grafts, scions, cuttings or buds, through the mails, is prohibited, excepting greenhouse-grown florists' stock, cut flowers, herbaceous perennials and bedding plants, which will be admitted provided that a detailed statement of the contents is attached to such parcels."

This Regulation takes effect on and after the first day of March, 1914.

Scideikin (G. S.). Вредители сельско-хозяйственных растеній Воронежской губерніи, по наблюденіямъ 1912. [Pests of agricultural plants in the Government of Voronezh, according to observations made in the year 1912.]—Published by the Zemstvo, Voronezh, 1913, 68 pp.

This is a report of the Government Entomological Station of Yoronezh, which was only inaugurated in May 1912.

Insects injurious to crops.—Calaptenus italicus, L., appears periodically, and is very widespread, but last year there were fewer complaints of its activity. Anthothrips acadeatus, F., and Limothrips denticronis, Hal., were found in some districts; the remedy suggested is to keep the fields clean from weeds, and to plough-in the stubble in which the insects winter. For Aelia acuminata, L., the following remedies are recommended: hand-picking, catching the young (wingless) specimens in trenches (containing bait-holes); surrounding the fields and spraying with soap water or naphtha emulsion at dusk or during moonlight nights.

Aphis gossypii, Glov., is specially injurious to Cucurbitaceous plants. Remedies: (1) repeated spraying with soapy water (1 lb. green soap, § lb. ordinary soap, and 2.7 gals. water) every 10 days from the moment of the appearance of the insects till the time of oviposition; (2) destroying by burning all attacked plants; (3) frequent re-ploughing of the infected areas during autumn and spring; (4) rotation of crops; (5) the removal and burning of all stalks and leaves after the harvest. The boring of grain by the larvae of Sitotroga cerealella, Ol., and Tinea granella, L., in stores, as well as in the fields, is very frequent. Remedies:

- (1) the immediate disinfection of the storehouses by carbon bisulphide;
- (2) the sorting of the seeds by winnowing in autumn and spring before
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sowing, as well as after thrashing, and burning or giving to cattle the winnowed seeds; (3) careful and deep planting of the seeds when sowing maize; (4) the destruction of the lumpy stratum formed by the caterpillars on the top of heaps of grain.

Phlyctaenodes sticticalis, L., appears yearly, doing more or less damage. Last year the caterpillars in some parts totally devoured the sunflowers, maize, pumpkins, melons and cucumbers. The caterpillars of Homoeosoma mebalella, Hb., do considerable damage to sunflower seeds. Phusia gamma, L., injures many cultivated plants, principally beets and linseed, but last year there were practically no complaints of its activity.

Lema melanopa, L., has done considerable damage to oats, barley, and summer-sown wheat, during the latter half of June and the beginning of July. As remedies are recommended: (1) shaking the insects off the oats with brooms in the mornings, after which the attacked spots must be dusted with ashes or lime through a sieve; (2) the spraying of three per cent, solution in water of barium chloride or Paris green (1 oz. green and 3 oz. freshly slaked lime in 6 gals, water); (3) summer sowing instead of winter sowing, or the earlier sowing of summer crops. Psylliodes attenuatus, Koch, Chaetoenema cominna, Chevr., and P. brerissenla, Fald., have damaged hemp seeds and beets. As a remedy "a tanglefoot cart" is suggested, consisting of a board on wheels, smeared on the lower side with molasses or pitch, to be wheeled over the plants during the hot hours of the day, so as to catch the insects when they jump.

Calandra granaria, L. In an appendix to the report the campaign against this pest in the municipal grain stores of Voronezh is described. Carbon bisulphide has been used successfully, and it has been noticed that this remedy gives better results in warm weather than during cold or windy weather. The germinating capacity of the grain is not affected if the proportions do not exceed about 1 lb. of bisulphide for each ton of grain. Lethrus apterns, Laxm., damages various young plants, and particularly sown sunflower seeds. The following remedies are given: (1) trenches round the plantation; (2) spraying with Paris green; (3) ploughing the infected plots in autumn or early spring, and keeping them clear from weeds to the end of May; (4) hand-picking.

Amorphia anstriaea, Hbst., is very widespread in the Government. The usual remedy consists in hand-picking, the insects being driven by a rope to one end of the field, where they are at once picked up by men with sacks. The Zemstvo pays a premium for the collection of this insect, and the author suggests that this ought to be encouraged and properly organised. The insect usually begins by damaging the ears of winter-grown crops, passing afterwards to barley and summersown wheat. The beetles oviposit in July on the borders of the fields, so that the ploughing of these parts in Angust would lead to the destruction of the eggs and of the young larvae.

Mayetiola (Cecidomyia) destructor, Say, is a serious pest of grain, and is found everywhere in the Government. The remedies usually applied are ploughing, burning of the stubbles and trap-crops.

The larvae of Bibio hortulanus, L., damaged sugar-beets in one locality; as remedies are suggested: the complete removal of the

remains of the harvest from the plantations; harrowing the infested plots in autumn or early spring, after spreading quickline; and spraying in early spring with a 4 per cent, solution of Chile saltpetre. Hylemyia coarctata, Fall., has done considerable damage to winter rye in one locality. Oscinis frit, L., is widespread, and often mistaken for M. destructor; it has damaged barley and black barley in some places. To fight the insect the author recommends: (1) to sow summer crops as early as possible, and use seeds which tiller less; (2) to place the seeds at a uniform depth, so that the sprouts should appear simultaneously; (3) not to allow the summer crops to get over-ripe; (4) to replough the stubbles immediately the harvest is over; and (5) not to sow summer crops near the damaged winter ones.

Orchard Pests.—Tingis piri, Geoffr., is found everywhere, and damages apple, pear and cherry trees, from July to September. Repeated sprayings with soap water (4 lb. ordinary soap in 2.7 galls, water) kills the insects. The autumn cleaning of the orchards from the fallen leaves and the burning of all waste is also recommended.

Pyslla mali, Först., has been proved to exist in several districts, and in the opinion of the author, probably occars in all the others, although growers do not notice its presence, and attribute the injury done by it to frost. Repeated and abundant spraying of the trees in late autumn and early spring with 3-5 per cent, solution of green copperas when the larvae appear; spraying with tobacco or quassia extract; and burning the small branches cut away in autumn and spring, are the remedies suggested.

Psylla pyricola, Först., Aphis ponoi, de G., Myrus cerasi, F., Hyaloptecus proni, F., and Rhopalosiphim ribis, Buckton, are found everywhere, and were successfully controlled by spraying with soapy water. Lepidosiphis abni, L., Mytilaspis ponorum, Bouché, and another unidentified Coccid were very widespread on apple trees. Amongst the suggested remedies are: spraying and smearing of the leafless trees in autumn and spring with limewash, containing 2-3 wine-glasses of crude carbolic acid or 1 lb. of green copperas to 2.7 galls, of the solution; the intensive manuring of the attacked trees: the pruning of the crowns; spraying with carbol or naphtha emulsions in May, June, etc.

The author considers that Hyponomeuta malinellus, Z., takes the first place amongst the pests of orchards in the Government. Its spraying with tobacco decoction (a handful of tobacco to each 2 gals, of water), which must be done when the caterpillars are still young and have not yet prepared their webs. It is also useful to spray the beatless trees abundantly and repeatedly in autumn and in spring, before the swelling of the buds, with a 5 per cent, solution of sulphate of iron; to burn the thin branches cut away from the trees; and especially to spray the crown with milk of lime to which sulphate of iron is added (1 lb. of sulphate to each 2.7 galls, of the solution). Hyponomeuta variabilis, Z., flew in great numbers near the town of Voronezh at the beginning of August, the larvae mining the leaves of cherries.

There was only one generation of Cydia (Carpocapsa) pomonella in

1912; although in June and July the caterpillars occurred everywhere in fruits, no pupae or moths of the second generation were found.

Cydia functiona, Tr., also damaged plums; the liming of the stems, the shaking down and collection of the wormy plums, and the digging up of all brushwood near the trees in autumn and in spring, are the remedies recommended. The caterpillars of Bembecia hylaciformis, Lasp., injured the stems of raspherry bushes; the most effective remedy is to dig out the injured stems with the roots in autumn and to burn them. There were complaints from various districts of damage to fruit trees by Cossus cossus, L., and Zeuzera pyrina, L.

The larvae of the following Lepidoptera are recorded as causing serious defoliation of fruit trees:—Aporia crataegi, L., Malacosoma neustria, L., Lymantria dispar, L., and Euproctis chrysorrhoea, L., for which the usual remedies are recommended. Among the injurious sawflies noted are:—Pteronus ribesii, Scop., on gooseberry bushes; Selandria adimbrata, Klug, on the leaves of cherry, pear and apple trees; and S. fulvicornis, Klug, on plums.

Sacharov (N.). « Нозявка » (Galericella tenella, L.) какъ вредитель клубники и другів виды изъ группы Galericini, встръчающіеся въ Астраханской губ. [Galericella tenella, L., as a pest of garden-strawberries, and other species of Galericini found in the Govt. of Astrachan.] —Published by the Entom. Sta. of the Astrachan Society of Fruit-Grovers, Market-Gardeners and Agriculturists, Astrachan, 1913, 6 pp.

There are several species of Galerucella found in the Government of Astrachan, such as Xanthomelacia, Schr., which injures elm trees; G. eibirini, Payk., attacking Vibirium opidus, and G. lincola, F., a pest of willows. Galerucella tenella, L., found by the author on strawberries, has not been previously recorded as injurious to these plants. The beetle winters underneath old leaves on the beds of strawberries; with the arrival of warm weather the insects appear and feed on the young leaves, and oviposit during April and May; the eggs are deposited by the female in a hole gnawed by it in the leaf, 3–10 eggs being laid in such a hole; the egg stage lasts 12–14 days. The author describes the egg larva, pupa and imago, as well as the damage done.

The remedies suggested are: the destruction of weeds on the beds and keeping the soil friable continuously during the whole summer; but the most effective remedy is spraying with Paris green (4 lb. of green and 4 lb. of lime dissolved in about 32-33 gals, of water); the spraying must be done first in April, as soon as the young leaves appear, then again in May, when the ovaries are formed, and again, if necessary, after the removal of the betries. As the insects keep mostly on the lower side of the leaves, special attention must be paid to spraying from below.

Russian Crop Pests. — Извъстія Главнаго Управленія Земпеустройства и Земпедъпія. [Weekly Gazette of the Central Board of Lind Administration and Agriculture,] St. Petersburg, no. 47, 7th Dec. 1913, p. 1210.

The past autumn was not favourable to the activity of various pests,

and they have not, therefore, caused much damage to sprouted wintersown crops. Euxon segetum was chief amongst the pests noticed, and it has been reported from nearly all the Governments outside the "chornoisiom" area, and also from the following "chornoisiom" Governments:—Orel, Riazan, Tambov, Voronezh, Kiev. Taurida, Ekaterinoslav, and the Province of Don. Winter-sown crops, especially the early ones, were, however, seriously injured by this pest in Kazan, Viatka, Olonetz, and the western parts of Perm, and in some localities it has even been found necessary to re-sow. Elaterid larvae have done some small damage in Kiev, Cherson, Charkov, Tchernigov, Poltava and Vitebsk. Mayetiola (Cecidomyia) destructor has been reported from Kursk, Orel, Tambov, Podolia, Kiev, Bessarabia, Cherson, Taurida, Ekaterinoslav and Poltava; while the presence of Oscinis frit has been noticed in Kursk and Charkov. In Tula and in the Vistula Governments the crops were damaged by larvae of Melolontha.

As to Asiatic Russia, Euxoa segetum and Elaterid larvae were reported from various parts of Tobolsk, Tomsk and Enisseisk, and in the steppe provinces of Akmolinsk, Semipalatinsk and Turgai, although the damage done by them was very small and limited to a few localities only. In Tobolsk, Haltica and Phyllotreta were found, while from Enisseisk and the province of Akmolinsk M. destructor was reported. Egg-clusters of locusts were deposited in large numbers in Tobolsk and Akmolinsk. All these pests have done, however, very little damage, and disappeared with the early rains.

SIJAZOV (M.). Наиболье дешевый и сильнодьйствующій инсентисидь для уничтоженія саранчевых в наськомых в. [The cheapest and most effective insecticide for the destruction of locust pests.] — «Туркестансное Сельское Хозяйство» ["Agriculture of Turkestan,"] Tashkent, no. 1, Jan. 1913, pp. 30-35.

. The author points out the advantages of sodium arsenite as compared with the insecticide usually applied in Turkestan, viz., Paris green with lime. The former dissolves easily in water, giving a solution which does not choke the sprayer; it withstands the influence of even heavy rains, when mixed simply with milk of line and not with molasses or treacle, sticking firmly to the plants, and not requiring repeated sprayings; and under equal conditions and in equal doses it proves twice as rapid in its effects as Paris green. He also states that whereas Paris green contains only 24.3 per cent, of metallic arsenic (not arsenic acid), sodium arsenite contains 45°2 per cent. The author further deals with the prices of this chemical and the duties on it in Russia, and gives a comparative table showing the amount and cost of both insecticides necessary for one dessiatin (2.7 acres) in Turkestan. From this it appears that when using sodium arsenite it is possible to obtain a saving of from 30 to 60 kopecks (71d. to 1/3) per dessiatin; taking into consideration that in Turkest in the campaign against locusts is distributed over large areas -50,000-60,000 dessiatins (162,000 acres)—this would result in a saving of about 10.000 rubles (£2.000).

The author points out that sodium arsenite, like Paris green, may

burn the plants, and requires careful handling by the workmen engaged in the operations.

PONIATOVSKY (S.). Нъ вопросу о борьбѣ съ Маронской Нобылкой, въ Бухарѣ. [On the question of the fight against Stauronotus matrocramus, Thb., in Bokhara.]—Agriculture of Turkestan, Tashkent, no. 2, Feb. 1913, pp. 109-114, 1 map.

The author first reports on the results of fighting locusts in the five districts of south-eastern Bokhara in 1912, where the campaign has covered nearly 200 square miles, and has cost about £22,000. He mentions that the method of applying movable iron screens has proved very cheap, and resulted in considerable saving; only some 270 acres of crops have been destroyed by the pests (non-flying insects), and enormous masses of the latter have been destroyed. In the eastern part of the Khanate no large swarms of locusts have been noticed since the campaigns of 1910-1911, but they are beginning to appear again, and it is estimated that next spring it will be necessary to start operations against them over an area of about 10 square miles. The favourable results were considerably diminished by the appearance of migrating locusts from the neighbouring steppes of Afghanistan, and apart from the damage done to crops by these flying swarms, they have deposited eggs over an area of 33 square miles, and about £32,000 are asked for the campaign during the next season. The author further draws serious attention to the fact of the immigration into Bokhara of locusts from Afghanistan, into which country according to statements by natives, they migrate from India, so that international endeavours are necessary to check the injurious activities of these pests. The author points out how the fight against locusts in the province of Samarkand proved fruitless so long as no remedies were applied against them in Bokhara, and how the fighting of the insects in that country led to a diminution and even total disappearance of them in some localities of Russian Turkestan. This does not apply to two other species of locusts found in Turkestan, namely Caloptenus italicus, L., which has a local breeding place, and Locusta migratoria, L., which breeds in the delta of the Syr-Daria, as well as at that of the Amu-Daria, but rarely flies far from its breeding places. The author further urges upon the Government of Bokhara the absolute necessity of fighting the insects, the expenses not exceeding 0.1 per cent, of the budget of the Khanate, which itself depends on the harvest and on the land duties collected in kind; he also points out the importance of the cotton cultivation of Bokhara and Turkestan to the Russian textile industry. A map is appended showing the distribution of locusts in Central Asia.

Sijazov (М.). **Нъ Біологіи Марокской Нобылки.** [On the biology of Stauronatus maroccanus, Thb.] - Agriculture of Turkestan, Tashkent, no. 2, Feb. 1913, pp. 115-126, 9 figs., 2 pl.

In the first part of his paper the author deals with the early stages of *Stauronolus marocranus*, of which he gives a detailed description. There are five moults, and the period occupied by these stages is 3542 days. The second part is devoted to a consideration of the movements of the swarms of larvae. After extensive investigations in the field, the author concludes that these movements are not influenced by such factors as wind, sun, etc.; nor do they take place in any definite directions, being merely the fortuitous result of the gregarious instinct combined with the search for food. Cultivated crops appear to exercise no special attraction for these insects, and if the wild plants on the steppes afford sufficient food, the locusts will remain there during their whole period of development. On the other hand, the migratory movements of the flying locusts are more definite, the swarms always entering Russian Turkestan from the south, originating in Afghanistan.

SMIRNOV (D.). Польза, приносимая Трясогусками въ Турнестанъ. [The utility of the Wagtail (Motacilla) in Turkestan.] -- Agriculture of Turkestan, Tashkent, no. 3, March 1913, pp. 149-251.

The author draws the attention of farmers to the value of these birds in destroying the common pest of lucerne in Turkestan, Hypera variabilis, Hbst. These weevils start ovipositing in the Mery oasis on young leaves of lucerne as early as February; in 1912 the author found larvae on the 1st March. Oviposition proceeds till April, and the larvae do considerable damage, estimated at 50 rubles (about £5.5s.) per dessiatin (2.7 acres); the damage is the more felt as at this time there are no supplies of lucerne from the previous year, and food for cattle is very dear. The larvae appear in greatest numbers in March, there being only one generation in the year. In March the wagtails appeared, and the author observed both Motacilla alba, L., and M. feldegii, Mich.; the former species is not a resident, and soon disappeared. The author has found in the stomach of 5 birds, which were able to feed only half a day, 152 larvae of Hypera and 2 beetles; he estimates that the whole flock of birds on the spot under observation numbered a hundred, and that these would have destroyed as many as 6,000 larvae in one day. The importance of these birds is the greater, as the pest has no other natural enemies in Turkestan; the author obtained only two specimens of the parasite Canidia curculionis out of a thousand larvae. He considers that all the birds of this genus are useful to farmers, as their life-habits are very similar.

Portchinsky (I. A.). Настномыя, вредящія хлтбному зерну въ амбарахъ и складахъ. [Insects injurious to grain in stores and warehouses.]—Труды Бюро по Энтомологіи Ученаго Номитета Глав. Управ. З. и З. [Memoirs of the Bureau of Entomology of the Scientific Committee of the Central Board of Land Administration and Agriculture,] St. Petersburg, x, no. 5, 1913, pp. 84, 5 tables, 3 figs.

The author prefaces his book by some introductory general remarks as to insects injurious to grain in Russia, where these pests have sometimes destroyed more than half of the stored harvest in some localities, which, especially in the eighties of last century, scriously injured the export of Russian grain; he describes, generally, the nature of the

damage and its influence on the quality of grain and on human beings consuming bread prepared from such flour. He also deals with some of the generally applied remedies, mentioning first salt, the use of which was recommended even in the eighteenth century. Another old remedy is birch-tar, and the author has satisfied himself by experiments conducted some 8 years ago, that this substance does not in any way interfere with the quality of bread obtained from grain subjected to its influence, no smell or flavour remaining. Some experiments by A. I. Dobrodeev have shown that Calandra granaria although remaining alive for some considerable time when exposed to the emanations from tar, are unable to feed or copulate, and mostly remain lying motionless on their backs; Anobium paniceum is better able to withstand its influence.

A still better remedy than tar is naphthalene, the use of which has also been recommended by the author since 1905, and this is now considered in Australia to be the principal preventive remedy. When used in small doses (small bags containing about ½ lb. of naphthalene each, put on the surface of the flour) and especially when applied to grain, it keeps away the insects and leaves no disagreeable taste in the bread prepared from such grain or flour. The author describes some experiments conducted on Silotoga cerealella, Anobiam pariacum and Calandra granavia with naphthalene, which show that all these insects ultimately perish after being subjected to its emanations for a more or less considerable period, remaining most of the time in a state of collapse. The methods of applying carbon bisulphide and hydrocyanic acid are also fully described.

A description is given of the following beetles and their various stages, together with an account of their habits and the damage done by them: Calandra granaria, L., C. orgzae, L., Anobium paniceum, L., Ptinns fur, L., Tenbrio molitor, L., Tribalium confusum, Duv., Gnathocerus cornutus, F., and Silvanus surinamensis, L. In addition to the usual remedial measures, mention is made of the use of sheep skins, which are spread in the evening on the stored grain; the insects settle on them and become entangled in the wool, so that they can be destroyed in the morning.

Besides the above insects, there were frequently sent to the Bureau samples of damaged flour containing other species which evidently did not cause serious injury to the flour, such as Enicmus minutus, L., Lathridius bergrothi, Reit., etc. There were also found very frequently, and sometimes in large numbers, the images and larvae of Luemophlocus testaceus, F., which some authors (Curtis) regard as injurious to grain, while others (Perris) consider it to be a rapacious insect. Tenchroides mauritanicus, L., is both injurious to grain and useful in destroying some other insects there; it damages much more than is necessary for its food by devouring the embryo of the grain.

Amongst the moths, Sitotroga cerealella, Oliv., is specially injurious in many parts of Caucasia and Transcaucasia; in the western parts of the government of Kutais, in some years it has destroyed the whole harvest of maize; besides which it attacks also wheat, rye, and barley. The author describes the life-habits of this pest as recorded by

Haberlandt, Kollar and others. Some experiments conducted in the Bureau of Entomology by G. V. Zelenko have proved that in order to destroy all the stages of this pest completely at the usual room temperature, 14–16° R (64°–68° F.), in an isolated space, it is necessary to apply not less than 7 lb. of carbon bisulphide for every 1,000 cubic feet during 48 hours; should it be required to get the same results in 24 hours, 10½lb. of liquid are necessary. The samples freed from the pests must be kept in closed spaces and be protected by naphthalene or tar.

Tinea granella, L., is commonly found in Russia in grain warehouses, but the damage done by it is not so great as that done by Calandra granaria. As remedies are mentioned the removal of the matted grain by means of rakes, which must be done before the autumn, i.c., before the larvae pass away from the grain to pupate, and the lowering of the temperature of the store by means of ventilation holes, etc. Trachea (Hadena) basilinea, Schiff., is very frequently found in Russia in ricks of unthrashed grain, and in stores, and often does great damage. These insects have only one generation during the year, the moths flying in summer, when the grain is developing in the ears, but the caterpillars are found during the whole spring, summer and autumn in different stages. The author describes the habits of the larvae and the damage done by them; during the harvest time most of the caterpillars fall from the ears to the earth, but in the evenings they get back to the sheaves remaining in the fields, and in this way they get into the ricks and barns. During the autumn their activity depends on the temperature, and in warm autumns they do considerable damage. Kiln-drying kills only the caterpillars near the floor of the kiln; by thrashing with chains only some of the larvae are destroyed, while thrashing with machines gives better results; winnowing does not separate them from the grain. Those larvae which remain in the fields feed on fallen grain or on grass, and pass the winter inside the stubble left in the fields. The author recommends that the sheaves should not be stacked in the same field in which they have been cut; should this be impracticable, the sheaves ought to be piled on a clean spot, surrounded by a trench, the latter being also quite clean from straw. The ricks ought to be loose, so as to allow of the ventilation of the pile and the access of fresh cold air, which will make the caterpillars harmless in the ricks till the arrival of warm weather. The caterpillars remaining in the fields can be best destroyed by allowing them to creep during the day underneath straw, spread in the field, which is afterwards burned. In the same way the stubble also must be burned, to facilitate which high-mowing is recommended.

The third group of pests are mites of the family, Tyroglyphdae, the most common representative of which in stored grain and flour is Tyroglyphus farinae, Koch; T. siro, L. and T. longior, Gervais, being found mostly in cheese and less frequently in grain and flour. The author describes the life-habits of this species. According to the experiments of Zelenko on some representatives of the genus Cheylelus, living in dry hay and in stored clover seeds, 10½ lb. of carbon bisulphide for a space of 1,000 cubic feet are necessary to destroy the mites within 24 hours.

Sacharov (N.). Медвъдка и мъры борьбы съ нею. [Gryllotalpa rodgaris and remedies against it.]—Poster issued by the Entom. Sta. of the Astrachan Soc. of Horticulture and Agriculture, Astrachan, 25th March 1913.

This poster gives general information as to Gryllotalpa, accompanied by figures of the imago, larva, eggs and damaged cabbage root and seeds, and suggests as the only effective remedy to use baits of maize poisoned with arsenic. In order to prepare these baits a mixture of about 3 lb, of arsenic, 6 lb, of lime, and about 36 lb, of maize is boiled together till the grains of maize are quite soft, adding water as it evaporates. The grains of maize ought not to be broken, as the insects may miss them in the earth. Having prepared the baits, the maize is spread on mats to cool, after which it is sown on the infected spot, 1 lb, of maize being used for every 10 cubic sajens [490 cubic feet]. The sowing must be finished 5-7 days before cabbage is sown on the spot; early in spring, when there is no other food, the insects will devour the poisoned baits and perish. In autumn another remedy is recommended, the object of which is to catch the wintering insects; for this purpose holes must be dug about 2-3 feet long, deep and wide, which are filled with well-rotted dung, and covered with earth; the insects enter these holes to hibernate, and at the first frosts they can be turned out and destroyed.

VITKOVSKY (N.). Краткій обзоръ главнѣйшихъ вредителей и болѣзней културныхъ и дикорастущихъ растеній въ теченів 1912 г. въ Бессарабской губ. | Brief review of the chief pests and diseases of cultivated and wild plants noticed during 1912 in the Govt of Bessarabia. |—Reprint from «Труды Бессар. Общ. Естеств. и любит. естествозн.» [Studies from the Bessarabian Society of Naturalists and Friends of Nature-study,] Kishinev, iv, 1913, pp. 17.

In an introduction to this review the author points out that the meteorological conditions in 1912 were specially favourable for various pests and diseases of plants. The following insect pests are mentioned in his list. Insect pests of orchards. Lepidoptera: Cydia (Carpocapsa) pomonella, a real scourge throughout the Government; Cydia funchrana, Tr., and C. pulaminana, Stgr., appeared everywhere, attacking plums and walnuts late in the season, but were controlled by some unknown factor; Aporia cratacgi, L., specially abundant in the "Bessarabian Bukovina," where the butterflies covered trees and earth "like snow"; the peasants there regard it as a sin to collect and destroy the nests of these pests: Euproctis chrysorrhoea, L., this and the preceding species were destroyed in their nests by Parus major: Lymantria dispar, L., Malacosoma neustria, L., Hyponomeuta malinellus, Z., H. variabilis, Z., Zeuzera aesculi, L., and Cnethocampa processionea, L. Coleoptera: Sciaphilus squalidus, Gyl., appeared early in spring in enormous quantities; Rhynchites bacchus, L., R. acquatus, I., R. pauxillus, Germ., R. betuleti, F., R. betulae, L.; Anthonomus pomorum, L., yearly destroys the whole harvest in one apple orehard of about 108 acres; Epicometis hirtella, L., and Lethrus apterus, Laxin. Tenthredinidae: Hoplocampa brevis, Klug, H. fulricornis, Klug. II. testulinea, Klug. Rhynchota: Lecanium sp. (trotundum, Réaum.), found in enormous quantities on plum trees in the "Bessarabian Bukovini '; these pests favour the growth of a fungus disease. Capnodium silicinum. Mont., and have led to a marked decrease in fruit-growing in the district: Lecanium mali, Schr., chiefly on apple trees: Aspidiotus astreaformis. Curtis, on pears, less frequently on plums, and only occasionally on apples; Mytilaspis pomorum, Bouché, on pears and apples; Psylla pyri, L., did serious damage to pears; Apithidae were very abundant during the year, injuring apples, plums and peaches; they were preyed on by numerous Coccinella septempanetata, L.; Tingus pyri, E. found only once: Philashus pari, Pagenst

F., found only once; Phytoptas pyri, Pagenst.

Insect pests of vine. Phylloxera castatrix, Pl., found everywhere on old vine stems; Melolontha melolontha, L., in some vineyards more than 100 larvae were found underneath one vine; larvae of Elekteria damaged young branches of vine; Eumolpus vitis, F., Phytoptas vitis, Insect pests of field crops. Oscinis frit, L., v. pusilla, Mg., is the

most widespread pest in the Government; Mayetiola (Cecidomyia) destructor, Say.; Chlorops taeniopus, Mg.; Anisoplia austriaca, Hbst.; Melolontha melolontha, L.: Lema melanopus, L.; Jassus sernotatus, Fall.; various aphides and thrips.

Maize was injured by larvae of M. melolontha, L., Pentodon idiota, Hbst., Elateridae, and Pyrausta nubilalis, Hb.; the spread of the latter pest is favoured by the neglect of the peasants to burn or destroy the naize stubbles, which they keep as food for cattle during the winter and spring, thus enabling the wintering pests to complete their development; the damage done by them is very serious. Winter rape was damaged by Entomoscelis adonidis, Pall., Athalia spinarum, F., and also occasionally by Phlyctaenodes sticticalis, L.; the latter also injured or destroyed melons, maize, vine and other plants. Cleonus punctiventris, Germ., was noticed in small numbers on beet; Otio-rhynchus ligustici, L., on lucerne; and Apion apricans, Hbst., on

Insect pests of market garden crops. Haltica oleracea, H. nemorum, Pieris brassicae, P. rapae, Mamestra brassicae and Aphis brassicae are the usual pests, for which no remedies are applied in Bessarabia.

Расzoski (J. K.). Обзоръ враговъ сельскаго хозяйства Херсонской Губернім и Отчеть по Естественно-Историческому Музею за 1912-1913 годь. [A Review of Pests of Agriculture in the Government of Cherson and the Report of the Natural History Museum for 1912-1913.]—Естественно-Историческій Музей Херсонскаго Губ. Земства.—(Pubd. by the Nat. Hist. Museum of the Zemstvo of the Govt. of Cherson,] Cherson, 1913, 34 pp.

Anisoplia austrica, Hbst., while totally absent in the northern parts of the Government, appeared in the south in numbers, suggesting that a serious outbreak of this insect may occur soon; this has not been the case for the last ten years. The larvae of Athous niger, L., damage wheat crops in some localities; while Epicometis hirtella, L., injured cars of oats. Two hemipterous insects were noticed on lucerne, which had not previously been observed on this plant, Adelphocoris

lineolatus, Goeze, and Acocephalus rusticus, F. The former species was noticed on two estates in the northern districts. According to I. V. Vassiliev the insect has two generations in South Russia.. It winters in the egg stage, the eggs being laid in the lower part of the stem of the lucerne stubble; the young bugs issue at the end of the spring and start sucking the tender parts of the plants; in the first half of July they reach their mature stage, ovipositing again in the autumn. Insecticides are of no avail, and the only remedy recommended by Vassiliev consists in destroying the wintering eggs by slightly burning the lucerne stubble. To effect this, the field of lucerne is covered with a loose and even stratum of straw of a thickness of about 3½ inches, which is burned in suitable weather, viz., dry, with a slight wind; the flame should pass rapidly and evenly over the field.

Vassiliev reports favourable results obtained by this method in the Government of Ekaterinoslav, and points out that the slightly burned plants of lucerne gave good new shoots. As to Acocephalus rusticus, F., its life-habits are little known; it appeared usually in company with Adelphocoris lineolatus, so that the particular damage done by it could not be ascertained. Macrosiphum pisi, Kalt., was also found on lucerne, where however, these lice do not multiply to a dangerous degree, they being chiefly pests of peas.

Phlyctaenodes sticticalis, L., appeared this year in many parts of the Government, injuring lucerne, maize, sunflower and potatoes; they did not touch Sisymbrium losselii, L., but were found frequently on S, sophia, L., also on Artemisia. Lethrus explaintess, Laxm., did some damage to linseed crops in the district of Cherson.

Epicometis histella, L., was found this season in lesser numbers than in previous years and has done damage only in some localities. In the environs of Cherson it attained its greatest numbers at the time of blossoming of the cherry trees, which suffered most from its attacks, The author experimentally tested the remedy recommended by J. F. Schreiner, namely, trapping the beetles on sheets of blue paper covered with an adhesive. He concludes that the method is of no practical value, as the insects did not show any preference for the blue sheets. It was noticed that the insects did not pay any attention to the blue flowers of Chorispora tenella, D.C., which grew underneath the cherry trees, or to other blue flowers, concentrating only on the blossoms of cherries. The same negative results from adhesive blue sheets were also reported from Turkestan with Oxythycea cinctella, and from Kishiney.

The following insects injurious to orchards have been noticed. Hyponomenta matinellus, Z., Enproctis chrysorrhoea, L., Malacosoma neustria, L., Cydia (Carpocapsa) pomonella, L., Acronycta tridens, Schiff., Colcophora hemerobichla, Sc., Phalera bucephala, L., Hylotoma rosarum, F., Tingis pyri, F., and Aphis ribis, L.

For the first time during his sixteen years' experience the author met with Pyslla pyricola, Först., and it raises the question whether the pest has only this year invaded the Government, or whether it has existed there previously without being able to develop to a noticeable degree, owing to some unfavourable conditions; as a remedy, dusting with tobacco is suggested. Eumolpus vitis, F., was also

noticed on vine for the first time in the Government, though known previously in Bessarabia. *Phytoptus pyri*, Sor., has done substantial damage in some localities, and occurred in considerable numbers. The following forest pests are reported. On oaks, two species of the genus *Haltica* appeared in some localities, the most serious damage being done to single trees and small scattered groups of trees on pasture land; oaks in enclosures, where no grazing took place, suffered less, or not at all. Leaves of elm trees were injured by *Galeruca ranthomelaena*, Schr. *Claudius viminalis*, Fall., were found on poplars in Cherson, there being evidently two generations of the pest in the Government.

Larvae of Cimbex amerinae, L., or a similar species, were noticed on Salix acutifolia, W., on the sands in the valley of the river Dnieper; the leaves were sometimes totally devoured, only the veins remaining, Lecanium robinarium, Dougl., is increasing in the Government; in the year under report they were found on Corylus avellana, and on maples in some localities.

Webster (F. M.) & Parks (T. H.). The Serpentine Leaf-Miner.— Jl. Agric. Research, Washington, i, no. 1, Oct. 1913, pp. 59-87, 17 figs., 1 pl.

The serpentine leaf-miner is the larva of Agromyza pusilla, Mg., a minute yellow and black fly, which is common in alfalfa fields during the summer; it has a wide range of food-plants, and is generally distributed over the United States. Outside the United States the species has been found in central and northern Europe, Italy, Sicily, and Egypt.

The larvae injure the foliage of the plant by devouring the parenchyma of the leaf; leaves of white clover and of young alfalfa often having the entire cellular tissue devoured, leaving only the two membranes. Usually only one larva is present in each leaf. The injury is greatest in the south-western States, where the discoloured leaves are sometimes present in sufficient numbers to lower materially the quality of the hay. The injured leaves can be found in the fields from May until November, the larvae continuing to feed until the frosts; in Florida the larvae feed throughout the winter, but usually the insect hibernates in the puparia beneath the surface of the soil at the base of the plants. There are five or six generations in lat. 41°, the number varying with the length of the growing season. The generations overlap to such an extent that all stages can be found in the tields during most of the season. During the period of highest temperature in summer, the larvae are usually found infesting plants protected from the direct rays of the sun; in the south-west the insect almost completely disappears from the fields at this time, reappearing in September.

The eggs are deposited in the leaf tissue, and are inserted in punctures identical with those made by the adult in feeding; the eggs take 4 days to hatch in June, the larval period being then 4 days. In the eastern States pupation occurs entirely in the soil; in the more

arid western States it takes place usually in the larval chambers in the leaf; the pupal period in June is 10 days. The average period of the complete life-cycle is 23 days.

Besides alfalfa, clover, cowpeas, rape and cotton are subject to attack. A few nearly-related and very similar leaf-miners are known to attack timothy, wheat, oats and grasses; when these crops are affected, the mine usually extends the entire width of the leaf, and may kill the plant if it is very young.

Numerous parasitic insects attack and consume the larvae and pupae within their mines; these are highly efficient and keep the insect under control. The following is a list of these parasites:—Diadinus begini, Ashm., D. websteri, Cwfd., Chrysocharis ainstiei, Cwfd., C. purksi, Cwfd., D. veisteri, Cwfd., Chrysocharis ainstiei, Cwfd., C. purksi, Cwfd., D. pictipes, Cwfd., D. varipes, Cwfd., Diadinopsis callichroma, Cwfd., Cirrospilus flavoviridis, Cwfd., Zagrammosoma multilineata, Ashm., Closterocerus utahensis, Cwfd., Pleurotropis ruposithorax, Cwfd., Eucoilahouteri, Cwfd., Sympiesis sp., Pteronalussp., Cirrospilus sp., Diadinopsis sp., and a species of ENTEDONINAE. Braconid parasites include Opius agromyzae, Vier., O. aridus, Gahan, O. humneipes, Gahan, and O. suturalis, Gahan. The following are predaceous upon the serpentine leaf-miner: Triphleps sp., and Erythueus sp. Most of these parasites are functional in the control of more than one species of leaf-miner, and are very widely distributed.

Frequent cutting of alfalfa kills the larvae in the leaves, and does much to protect this crop; this method should be followed where the injury becomes serious. Deep autumn or winter ploughing is advocated for annual forage crops and cereals, in order to bury deeply the hibernating puparia located near the surface of the ground.

DE CHARMOY (D. d'E.). Summary of investigations on Insect Pests during the three months, May-July, 1913.—Mauritius Dept. of Agric., Dic. Entom., 27th July 1913, 2 pp.

The sugar-cane leaf aphis (Aphis succhari). By the middle of June fields severely infested by these plant-lice were noticed on two plantations. As predaceous insects, such as Syrphidae and Coccinelladae were found at work, no remedy was suggested. A fortnight later the pest was found to have been completely checked by a fungus disease, and the plants were rapidly recovering.

In June the manager of the Bassin Estate found White Tannas diseased. These were uprooted, and the damage was found to be due to "montones" (Orgetes and Luchmosterna larvae). The larvae were dug out, and with them a certain number of Scolia rufa, which were proved to be parasites of the Orgetes larvae.

Chiomaspis legalensis. Samples of sugar-cane received from Industry Estate, Long Mountain, were found heavily infected with this scale insect, and about five acres of another plantation were entirely covered with this pest. Early cropping and burning of the canes before cutting have been suggested as a means of getting rid of the insect.

The sugar-cane white louse (Pseudococcus calceolariae var. sacchart). Young virgin caues were found suffering from this scale-insect, which was attacking the roots, this being due to infested cuttings not having

been disinfected. A fungus disease was keeping down the Coccid, the aggregated insects being reduced to a sort of pulp. For disinfecting the cuttings kerosine mixture has been suggested. For this mixture, to 25 grams of soap disolved in 500 c.c. boiling water, add 2 litres petroleum, gradually stirring the while; add to 600 c.c. of this emulsion, 400 c.c. of Phenyl, or 300 c.c. of Creolin. This mixture at a strength of 1 per cent. in water damages green leaves, and should only be employed for disinfecting the soil or against scale insects attacking the bark.

HARDENBERG (C. B.). Peach-tree Aphides.—Agric. Jl. Union S. Africa, Pretoria, vi, no. 2, Aug. 1913, pp. 224-235.

During the winter and early spring of 1912, the author made some observations and experiments regarding the life-history and control of the black and green peach aphids [Aphis persicue, Boyer, and Rhopalosiphum dianthi, Schr.] in the Pretoria and Johannesburg districts, where the two insects are generally very prevalent, and may cause a complete failure of the peach crop in some localities. The observations can be divided into such as relate to (a) life-history, including hibernation and dispersal; (b) parasitism; and (c) the use of tobacco extract as a means of control.

The following summary is given of the results of the experiments:--(1) In sheltered situations the black peach aphis probably hibernates on the trees, and may breed through the winter; (2) though primarily infesting the young shoots and truit-buds, the black aphis will also attack the leaves; (3) dispersal takes place most probably through the agency of winged individuals, which are produced as soon as a favourable mean temperature is reached; the distribution is too scattered to admit of its being effected by ants carrying the young aphides to other situations on the tree; (4) the presence of aphis at the base of the flower-bud causes it to swell and open prematurely, or at least in advance of others which are not attacked by aphides; (5) the green peach aphis breeds in the winter on cabbage, parsnips, and probably other cruciferous plants; (6) in the absence of definite data regarding the season history of the black aphis parasite, we may presume that the hibernating colonies keep this parasite breeding through the winter season; (7) the black peach aphis is attacked by one hymenopterous internal parasite and preved upon by two species of Syrphid flies and three species of lady-birds; (8) the total length of the life-cycle of the Syrphid, Xanthogramma scutellaris, is about three weeks; egg stage, three to four days, larval stage about twelve days, and pupal stage five days; (9) the Syrphid pairs in late afternoon; eggs are deposited at intervals of about one minute; (10) tobacco extract in a solution containing about 0.082 per cent nicotin is the most effective strength; no advantage is gained by using a stronger solution; this kills the aphis within 24 hours, being equivalent to a dilution of "Eagle Brand" extract of 1:100, and of "Lion Brand" extract 1:80; (11) the tobacco wash is more effective in sunshine than in dull cloudy weather; (12) green peach aphis can be effectively kept under control by three thorough sprayings about five days apart, the first being applied as soon as the first leaves open out; the first appearance of the aphis should be watched for closely; (13) for effective spraying an underspray attachment is essential; the spray should

be applied along the branch from below (towards the tip of the branch or twig), as the force of the spray will momentarily open the curled-up leaves; (14) the use of soap at the rate of 1 lb. in 25 gallons of spray is advisable; (15) the cost of the application should not exceed 18. 6d. per tree for the three sprayings together; (16) by means of these three sprayings a good crop of peaches can be secured, even in heavily infested orchards; (17) clean cultivation between the trees is advised; cabbages, parsnips or cruciferous vegetables should not be grown during the winter in or near the part of the garden where peach trees are standing, as they furnish breeding places for the green peach aphis.

In a note by Mr. Lounsbury it is stated that the above report on spraying tests concerns the green peach aphis. The black species is commonly found during winter; and when it has to be combated, it is is advisable to take advantage of the nakedness of the twigs, by making a thorough application of the spraying preparation shortly before the buds open. Should three sprayings, as recommended, not suffice for the control of the green species, as may be the case in seasons which particularly favour the pest, applications at intervals of about five days should be continued.

VAN DINE (D. L.). Report of the Entomologist.—Expt. Sta. of the Sugar Producers' Assn. of Porto Rico, Rio Piedras, P.R., Bull. no. 5, Aug. 1913, pp. 25-46.

In this report the author states that the May-beetles and their white grubs form the first line of his work, since the control of these insects is the most acute problem before the planter. The following is a list of the insects affecting sugar-cane in Porto Rico, together with their natural enemies, and an indication of the injury they cause: —

(1) The moth stalk-borer (Diatroen saccharalis, F.) tunnels into the cane stalk; kills young cane; affects the germination of seed cane. Its enemies are an egg-parasite, Trichogramma minutum, Riley; a Tachinid fly, Tachinophyto (Hypostena) sp.; and a fungus, Cordiceps barberi, Giard; (2) May-beetles and white grubs (Luchnosterna spp.) The adults feed upon the leaves, and the larvae upon the roots and the root-stalks externally; their enemies are: a wasp, Elis sercinta, F.; the Tachinid flies, Cryptomeigenia aurifacies and Entrixoides jonesii; an Elaterid beetle, Pyrophorus luminosus, Ill.; a fungus, Metarrhizium anisophiae, Metsch.; "blackbirds" (Crotophaga ani and Holoquiscalus brachypterus); (3) the weevil root-borer (Diaprepes spengleri, L.), whose larvae feed within the root-stalk and prune the roots to some extent; the blackbirds, noted under Lachnosterna, feed upon its larvae at ploughing time: (4) Rhinoceros beetles (undetermined Dynastids). Their larvae feed upon the roots, and within the root-stalk; the fungus, Metarrhizium anisopliae, and the blackbirds, both noted under Luchnosterna, are natural enemies; (5) The Mealy-bug (Pseudococcus sacchari, Ckll.), feeds on the underground portions of young cane, at the base of the leaves, and beneath leaf-sheaths of older cane; the introduced ladybird beetle, Cryptolaemus montrouzieri, Muls., and the parasitic fungi, Aspergillus sp. and Isaria sp., are natural enemies; (6) the mole-cricket (Scapteriscus didactylus, Latr.), eats into seed cane and the young shoots beneath the surface of the ground; natural enemies are the blackbirds and lizards; (7) the southern grass-worm

(Laphygma frugiperda, S. and A.), the larvae of which cat leaves of young cane. A Braconid, Chelonus insularis, Cress. (!); the Tachinid flies, Frontina archippicora, Will., Gonia crassicornis, F., and Archytas piliventris, Wulp; a Carabid beetle, Calosoma alternans, F.; the fungi, Botrytes sp. and Empusa sp., and the blackbirds are natural enemies; (8) the grass-looper (Remigia repanda, F.), the larva of which eats leaves of young cane, the natural enemies being Tachinid flies and a Carabid beetle, Calosoma alternans, F.; (9) the West Indian sugar-cane leaf-hopper (Delphax saccharicora) feeds on leaves and stalks of young cane; its natural enemies are: a Mymarid, a Dryinid and a Stylops; (10) the sugar-cane Aphid (Sipha graminis, Klt.) feeds on the leaves; its enemies are: a Syrphid fly, Ocyptamus sp.; ladybird beetles, Cycloneda sanguinea, L., Megilla innotata, Muls., Seymnus locurii, Muls., S. roscicollis, Muls.; a lace-wing fly; a fungus, Acrostalagmus sp.; (11) the hard-back or black night-beetle (Liqurus tumulosus, Burm.), the larva of which is found at the roots, and is attacked by a wasp, Campsomeris dorsala, F.; (12) the weevil stalk-borer (Metamasius hemipterus, L.), follows disease or other injury, infesting both stalks of growing cane and seed cane; no enemies have been observed; (13) the shot-hole stalk-borer (Xyleborus sp.) follows disease, usually the rind disease (Melanconium sacchari), in the stalks and seed cane; no enemies have been observed; (14) the grass-worm (Cirphis latiuscula, H. S.), eats young leaves; a Braconid (undetermined) and the blackbirds are natural enemies; (15) a Skipper (Prenes nero, F.), whose larva cats young leaves; it is parasitised by a Braconid; (16) the scale-insect, Targionia sacchari, Ckll., parasitised by a Chalcidid; (17) the green Diabrotica (Diabrotica graminea, Baly), the adults of which feed on the leaves to a slight extent; the habits of the larva are not known; no enemies have been observed; (18) a termite (Eutermes morio, Lath.), attacks the seed end does not appear to have any enemy; (19) an undetermined Tineid, attacks the base of young shoots and eyes; no enemy has been observed; (20) mites have been observed to feed upon the stalks beneath the leaf-sheath and upon the leaves; no natural enemies observed.

An extensive bibliography of 41 works, containing papers on Porto Rico sugar-cane insects follows. From this list the author gives a general summary, referring to the injurious species according to the part of the plant they affect.

It was in 1910 that the larvae of the so-called Rhinoceros beetles were discovered, and in 1911 about 15 acres of cane were found infested to a serious extent by them. Thus far the insect has been observed breeding at the roots of cane only on the south coast of the island; it is also found in old wood in the forest. The grubs are eaten by the blackbirds at ploughing time, and the local form of the parasitic fungus, Metarrhizium anisopliae, also attacks them. The plantation practice of planting cane by opening up new furrows between the old rows without first ploughing out the old stubble, greatly favours the development of the grub of the Rhinoceros beetle, and of the white grub of the May-beetle. The old stubble should be thrown out, as then the blackbirds are able to feed upon the grubs, and the latter may also be picked up and destroyed. It seems probable that this Rhinoceros beetle is a species recorded under the name of Strategus titanus from the islands of St. Croix and Jamaica, as a pest of the

sugar-cane, and which is also recorded from Porto Rico by Stahl. The weevil root-borer (Diaprepes spengleri, L.), which in the larval stage attacks the roots of sugar-cane, must now be added to the list of borers affecting the plant in Porto Rico. The adult weevil has already been recorded as an enemy of citrus trees, and as common in coffee plantations, and was stated to have other hosts, as the guava, avocado, mango and rose. The author has observed the adult weevil feeding on the leaves of the sugar cane and on those of the "jobo," Spondias lutes. The blackbirds feed upon the weevil root-borer at ploughing time. Generally, the measures of control would be collecting the grubs and adults.

Schwartz. Nikotin als Insektengift. [Nicotin as an Insect Poison.]— Mitt. k. biol. Anst. fur Land- und Forstwirtschaft, Berlin, viii, 14th Sept. 1913, pp. 36-37.

Laboratory experiments were made to find the effect of nicotin and its salts upon insects. Besides pure nicotin the following salts of it were used:—lactate, acetate, trichloracetate and nitrate. All these substances, in 0.015% solution, acted as a skin poison upon Aphids (Rhopalosiphum ribis). Solutions containing 0.025% of the substance killed 93-98% of the Aphids. As an internal poison, 0.05% solutions were effective for caterpillars of Vanessa polychloros, V. io, and Orgyia antiqua; 0.2% solutions for caterpillars of Lymantria dispar and Stilpnotia salicis; and 1% solutions for Malacosoma neustria. Poisoned food affected only the caterpillars of Vanessa io and polychloros. In the cases where the caterpillars of these species ate leaves sprayed with nicotin compounds, they pupated imperfectly, and in no cases were butterflies produced from them. The spray solution used was 0.05% in strength. The difference in action of the several compounds of nicotin used was not worked out.

The following Series of Abstracts is taken from «Садъ, Огородъ, и Бахча*» [Orchard, Market Garden & Bachza.]—The Journal of the Astrachan Society of Fruit-Growers, Market-Gardeners & Agriculturists, Astrachan.

Sacharov (N.). Opatrum sabulosum, L., накъ вредитель бахчевыхъ растеній въ Астраханской г. и подсолнуховъ въ Саратовской. [Opatrum sabulosum, L., as a pest of cucurbitaceous plants in the Govt. of Astrachan and of sunflower seeds in the Govt. of Saratov.] - Orchard, Market-Garden & Bachza, 1913, Reprint, 2 pp.

The larvae of this Tenebrionid beetle in their life-history, and in the character of the damage done by them, resemble the larvae of Agriotes lineatus, L. The author points out, therefore, that not all the injury

^{*[}The Tartar word **bax4a** (Bachza) is used in South and South Eastern Russia of fields set apart for the cultivation of various species of melon, chiefly water melons, the yield varying from 110 to 300 melons per acre. These fields are only used for this purpose for one year, after which they are given up to ordinary crops. In some parts of the chornoiziom area cucumbers and other vegetables are grown on these fields.—Ed.]

attributed to the latter pests is really done by them. He obtained this year, some larvae from the Zemstvo of Saratov, which have damaged sunflowers, and from them he reared some O. sabulosum, the remaining larvae producing A. lineatus, and another unidentified beetle. In the same way he obtained an image of O. sabulosum from some larvae which were damaging lemons in the Government of Astrachan.

These insects live during the whole summer, often hiding underneath stones or dry cattle-dung; they are found in large numbers in both the above Governments, and in the opinion of the author, about 90 per cent. of the damage to "backza" plants in Astrachan, usually attributed to the larvae of A. lineatus, is really done by the former pest when the larvae of Euxoa segetum are absent.

The author describes the larva, pupa and imago of the Opatrum. As to remedies, further investigations will, he says, be necessary.

VOSTRIKOV (P.). Hopotam [Bark Beetles.]—Orchard, Market-Garden and Bachza, Feb. 1913, pp. 40-41.

The habits of Eccoptogaster rugulosus, Ratz., and E. mali, Bechst., are very similar, and both injure mostly cherry trees and plum trees, but also apple, pear, apricot, etc. There are two generations; the first occurring from the first half of May till the end of July, the second from July till the end of summer. The control of the insects is not an easy matter, the part played by parasites being minimal, and insecticides being of little avail. As preventive remedies, the author recommends smearing over the trunks of trees early in spring, before the opening of the buds, with 3 per cent. solution of iron-sulphate, or with a mixture of milk of lime with iron sulphate (I lb. of the latter in about 2.7 gallons of water). As to destructive remedies, the cutting in spring of those branches which have no leaves, the cutting out of the larvae from the trunks in May and June, smearing over the wounds with lime and clay, or with garden tar, are recommended. It is also useful to plug the openings on the bark and any wounds with a mixture of one part of carbolineum with two parts of lime. Sorbus and Crataegus ought to be excluded from gardens or used as bait trees, and burned afterwards. In the same way damaged trees ought also to be burned, as well as injured branches, etc.

RASTEGAJEV (P.). Наилучшій способъ уничтоженія медвѣдии въ садахъ и огородахъ. [The best method of destroying Gryllotalpa in orchards and in market-gardens.]—Orchard, Market-Garden and Bachza, Feb. 1913, pp. 41-42.

The author describes, generally, the damage done by these pests to orchards and market gardens, which in south-eastern Russia is enormous. He recommends a new remedy, which he considers superior to all those usually recommended, such as (1) bait-holes; (2) poisoning by maize; (3) destruction of the nests with eggs; (4) spraying of the soil with carbon bisulphide; (5) moistening of the beds with a mixture of water and carbon bisulphide; (6) addition of turpentine to the water used for watering the beds, etc. His remedy consists in pouring naphtha into the burrows of the insects. For this purpose

a jug containing water and naphtha, the latter keeping on the surface of the water, is used; having found a burrow, the naphtha is first poured in, either through a special tube attached to the lip of the jug, or by simply pouring it over the edge; then water is poured in so as to drive the naphtha into the hole; one half to 1 pint of water over some naphtha proves sufficient to drive out the insect, and it perishes soon afterwards. He reports that in this way a boy (whose daily wages were 25 copecks—about 6d.), has destroyed 300 insects in a day. The author has also invented a special jug, with two tubes, and two separate compartments for water and for naphtha.

Sacharov (N.). Гусеница бабочки Evergestis extimalis, Sc., какъ вредитель и выоторыхъ огородныхъ мультуръ. [The caterpillar of Evergestis extimalis, Sc., as a pest of some market-garden crops.]—Orchard, Market-Garden and Bachza, March 1913, pp. 160-161, 3 figs.

It has not been previously reported that the caterpillars of Evergestis extinalis, Sc., injure cruciferous plants, but during last summer they have been noticed damaging sprouts of radish and turnip in one experimental nursery in the Government. The author describes and figures the imago and the caterpillar, and figures also a damaged pericarp. The eggs are deposited on the pericarps and the caterpillars feed on the seeds. Pupation takes place on the same plants on which the caterpillars have fed, between the leaves or the branches of the stalks. It is assumed that there are two generations, the second one breeding on wild Cruciferae. Paris green may serve as an insecticide, as the insects feed also on the outer parts of the fruits.

Sacharov (N.). Oecanthus pellucens Scop., накъ временный сожитель виноградной лозы. [Oecanthus pellucens, Scop., as a tempotary parasite of vine-branches.]—Orchard, Market-Garden and Bachza, April 1913, pp. 193-196.

The tree cricket, Occanthus pellucens, oviposits inside the summer branches of the vine, laying two, and sometimes three eggs in one hole; the larvae emerge from the egg in the following spring, the imago appearing in July. The author is of opinion that this insect is rather useful than injurious, as from the moment of its hatching out till late in the autumn, it destroys plant-lice wherever it can find them. As to the oviposition on vine, the insect only casually visits this plant, and the damaged branches do not suffer from the piercing, as the openings grow over again later. As it oviposits also on those parts of the summer branches which are cut off and burned before the winter, numbers are destroyed. In Astrachan the insect survives by depositing its eggs over the winter on Rubus caesius, L.

Sachabov (N.). Отъ Энтомологической станціи Астраханскаго Общества Садоводства, Огородничества и Плодоводства. [Notes from the Entomological Station of the Astrachan Society of Horticulture and Agriculture.]—Orchard, Market-Garden and Bachza, April 1913, pp. 196-200.

The author calls attention to the appearance of a Chrysomelid

beetle, the larvae of which mine the leaves of garden strawberries. On some leaves as many as 270 eggs were found, and the larvae threatened to destroy the whole crop of strawberries. He suggests spraying the plants with Paris green, repeating the spraying later when the ovaries are well formed. The insecticide must be used in a proportion of 1 oz. of green and 2 oz. of lime dissolved in 7 gallons of water.

In some parts of the Government larvae of a Galerucid beetle, Leptosonyx silphoides, appeared, moving in large numbers over the steppes, after the manner of Phlyctaenodes sticticalis; the author is, however, of opinion that this insect feeds only on wormwood, not touching cultivated plants.

Recipes are given for one insecticide and two fungicides. The insecticide is recommended against pests of the vine, and consists of a solution of $2\frac{1}{2}$ lb, sulphate of iron in $23\frac{1}{2}$ ga's, water, with which the young buds are to be sprayed in early spring.

Sacharov (N.). Asiatchas capahya въ низовьяхъ Волги и борьба съ нею. [Asiatic locusts in the lower parts of the Volga, and the fight against them.]—Orchard, Market-Garden and Bachza, July and Sept. 1913, pp. 436-440 & 559-563, 11 figs.

The southern parts of the Government of Astrachan, along the banks of the Volga and of the Caspian Sea are most suitable places for the breeding of Asiatic locusts (Locusta migratoria and L. daniea); the coasts are covered with reeds, there being also various meadow plants, and the soil is suitable for the oviposition of these insects. The people in these parts are mostly fishermen, and, therefore, the damage done by the pests is usually disregarded, the locusts appearing every year without exception. Oviposition takes place at the end of August and during September on friable, sandy or loamy soil, and the hatching begins in May. The spring floods of the Volga destroy large numbers of eggs, and the author is of opinion that if this were not the case, the locusts would become so numerous as to threaten even many central Governments of Russia.

The following parasites of locusts are mentioned:—Sarcophaga lineata, Fall., which mostly parasitises the larvae, and another fly of the genus Anthomyia, which attacks the winged insects. Besides these flies, the following insects prey on the eggs of the locusts:—Epicanta erythrocephala v. latelineolata, Mylabris calida, and the larvae of flies of the genus Systocchus; the latter being found by the author in 20-25 per cent, of the egg-clusters.

The difficulties in combating the insects are considerable, owing to the situation of the breeding places among flooded reeds, and the lack of workmen on the spot, etc. The method adopted was spraying with Paris green (1 lb. of green, 4 lb. of milk of lime, and 2 lb. of a special glue, in about 14 gallons of water); for the later larval stages the insecticide was made even stronger.

Rastegajev (P.). Мои спучайныя наблюденія за вредной д'ятельностью арбузнаго червя. [My casual observations on the injurious activities of the Melon-Worm.]—Orchard, Market Garden and Bachza, Sept. 1913, pp. 565-568.

The name of "melon-worm" is applied to the larvae of Euxon segetum, and the damage to melons was observed only in the first half

of June, when many of the young sprouts were destroyed. Hand-picking at night was adopted, and the remaining plants were saved, 500 caterpillars having been collected on a space of 2 acres. The author also suggests spraying with Paris green (about 1½ oz. of green in about 2.7 gallons of water).

Ryshkov (N.). Мышьяковистая известь и парижская зелень, какъ инсектисиды. [Calcium arsenate and Paris green as insecticides.] —Orchard, Market-Garden and Bachza, Oct. 1913, pp. 643-644.

The author reports the results of spraying with the above-mentioned insecticides in various orchards. In one case calcic arsenate was used, prepared as follows:—1 lb. of arsenic with 11-2 lb. of soda, being boiled in about 2.7 gallons of water till the arsenic was quite dissolved, which took about an hour; after this some 5 lb. of lime was added and boiled for another half an hour; this solution was made up to 270 gallons with water. Although there were rains during the spraying, and this was not repeated, the results obtained were excellent; and, whereas, during the previous year, C. pomonella destroyed more than three-quarters of the harvest in this particular orchard, no specimens of the pest were noticed this year. In another orchard the spraying was done with Paris green dissolved in sal-ammoniac, the amount of the latter being just sufficient to dissolve the green, and 1 oz. of this mixture was dissolved in 19 gallons of water; while in a third orchard the insecticide used was Paris green with lime (about ½ oz. in 2.7 gallons of water). The results obtained were favourable with regard to Hyponomeuta malinellus, the larvae of which perished after 3-4 days, keeping all the time on the ends of the branches; while the activity of *C. pomonella* was practically unaffected.

LONG (H. C.). The Large Larch Sawfly.—Gardeners' Chronicle, London, liv, no. 1394, 13th Sept. 1913, pp. 184-185, 1 pl.

The Large Larch Sawfly, Nematus erichsoni, has caused much damage in Britain since 1904; up to that time it had not proved harmful, but in 1904 it was observed in injurious numbers in Cumberland, and in 1905 it was reported as having wrought great havoe, and again in 1906. Since that time larch woods have suffered much from this insect, which has now been scheduled as notifiable to the proper authorities. In 1908, in Keswick, 200 acres were attacked, and hundreds of the trees had died; on Skiddaw alone 30,000 trees had to be felled in 1912 on account of the pest. This sawfly has been recorded in Germany, Switzerland, Holland, Denmark, Sweden, Finland, the United States, and Canada.

The damage is done by the larvae, which feed voraciously on the foliage of the larch; trees of any age may be attacked. Repeated defoliation may kill the tree. When full-fed the larvae enter the moss or soil beneath the trees and spin strong brownish cocoons, in which they pass the winter, pupating in the spring. The flies emerge from May to July, during which time eggs are laid. Hewitt found that development was parthenogenetic.

The sawfly is subject to attack by a number of parasites, chiefly the Ichneumon, Mesoleius aulicus, which is responsible for the death of

large numbers of the insect, to the extent sometimes of 70 per cent.

A fungus (Cordiceps) also infests the cocoons.

Since tall trees are attacked, remedial measures against the infestation are rendered more difficult. Means of combat include crushing the larvae when near enough to the ground; poisoning by spraying with lead arsenate or Paris green; and destroying the cocoons in the soil, under the trees, during the winter.

LONG (H. C.). The Cherry Fruit Fly. Gardeners' Chronicle, London, liv, 18th Oct. 1913, p. 271, 1 pl.

The Cherry Fruit Fly (Rhagoletis cerasi, L.) has been known on the Continent for a long time; but English cherries do not appear to have ever been attacked. Affected cherries are, however, constantly imported into England, and in consequence it is not impossible that the pest may at any time establish itself in this country. Theobald says that should it become noticeable in any plantation or garden, it would be wise to forego the crop by having the fruit destroyed to prevent damage another year, and the possible spread to other plantations.

The Cherry Fly may be combated by the collection and destruction of affected cherries; giving poultry the opportunity of picking up fallen cherries and maggots, as well as pupae in the soil; combined with surface cultivation in autumn and winter, to expose the pupae to birds and the rigours of the weather.

Plant Bugs on Hevea brasiliensis.—Jl. Board Agric. of Br. Guiana, Demerara, vii, no. 2, Oct. 1913, p. 74.

An increase of the Pentatomid Bug, Empicoris variolosus, is reported. These are difficult to detect, as during the day they hide in depressions of the bark, old tapping wounds, etc. It is supposed that they cause exudation of the latex from young green shoots by sucking them. The matter is under investigation.

Theobald (F. V.). The British Species of the Genus Macrosiphum, Passerini. Pt. H.—Jl. Econ. Biol., London, viii, no. 3, 29th Sept. 1913, pp. 113-154, 29 figs.

In the first part of this paper (Jl. Econ. Biol., viii, No. 2) [see this Review, Ser. A., i, p. 332], a list of fifty-five British species of the genus Macrosiphum was given, and of these twenty-five were described. The present part deals with the remaining species, and five more are added to the list, bringing the number up to sixty. Of these, twelve species are new.

Felt (E. P.). Twenty-eighth Report of the State Entomologist, 1912.—Bull. N.Y. State Mus., Albany, N.Y., no. 165, 15th July, 1913, 264 pp., 79 figs., 14 pls.

The authorship of the above paper, of which an abstract was given on p. 527, Vol. i., Series A., was attributed in error to the Director of the Museum instead of to Dr. E. P. Felt.

The reference should read as above.

NOTICES OF ENTOMOLOGICAL APPOINTMENTS, &c.

Mr. Nowell, the Assistant Superintendent of the Local Department of Agriculture, Barbados, who was principally engaged upon Mycological and Entomological work, has resigned, and has now been appointed as Mycologist to the Imperial Department of Agriculture, Barbados. Mr. J. Sydney Dash, B.Sc., has been appointed in his place, and is expected to take up his duties in February.

Mr. C. F. C. Beeson, Indian Forest Service, has been appointed Forest Zoologist to the Government of India on the resignation of Dr. A. D. Imms. BOIKIN (G. E.). A New Insect Pest of Coconut Palms in British Gulana, Castnia daedalus, Cramer.—Jl. Board Agric. of Br. Guiana, Demerara, vii, no. 2, Oct. 1913, pp. 87-90.

The author states that in a coconut palm, well advanced in growth, the presence of the larva of this moth is easily detected, the signs of attack consisting of deep, irregular, longitudinal sears or furrows, running up the trunk of the palm in continuous lines, often 3 to 4 feet in length. The larvae themselves live in the burrows, which they make between the trunk of the tree and the broad and thickened bases of the leaves. In cases of severe attack, the trunk of the palm immediately beneath the crown may become so weakened that a strong gust of wind will cause the head to snap off. Frequent cases of this are to be observed on the Demerara River. The financial loss occasioned by this pest is an exceedingly serious matter, especially as the adult insect is winged, and capable of sustained and powerful flight. Descriptions of the various stages of the insect follow, but as regards the life-history little is known at present, any close investigation being an exceedingly difficult matter. The moths themselves are entirely nocturnal, and may at times be seen on the wing at dusk. Drastic measures are necessary to prevent further damage in the case of a heavily infested palm. All the lower leaves have to be carefully removed by cutting them away at the base and securing the larva. In this way as many as 19 larvae and pupae of Castnia duedalus have been taken from a single palm. Palms in an infected district should be examined at regular intervals for the presence of this pest, and to this end, the lower and older branches should be regularly removed, and the tree kept generally clean. No natural enemies have been discovered so far, but U. daedalus does not appear to infest palms inhabited by the so-called "Kop-Kop" ants.

Sugar-cane Pests in British Guiana.—Agric. News, Barbados, 16th & 30th Aug. 1913, pp. 226 & 282.

The large moth borer (Castnia licus) was present on most estates in 1912, the grand total of insects captured in all three stages on seventeen estates being 1,018,901, as against 2,384,430 for 1911. This decrease is stated to be due to nine months' extreme drought, and to the excellent work of collecting in 1911. The conclusions regarding methods of control are: - (1) Long-continued drought affects the insect adversely; (2) the peristent and vigorous collecting of caterpillars and pupae in the stools of canes is the most efficient method of fighting this pest; (3) the collection of the moths is a very useful practice; 41 birds may be encouraged by means of perches in the cane-fields, and these are useful aids in the control of Castnia; (5) continued warfare must be kept up against this pest until it is reduced to very small numbers over a series of years; a decrease for one year should not be taken as a reason for ceasing control operations; (6) continued efforts on one estate, or on a group of estates may result in practically freeing them from Castnia licus, although in localities near by the jest may be abundant; in such cases, however, the numbers can be kept down only by persistent effort year after year. The most important sugar-cane pests in British Guiana are the small moth borers

(Diatraea saccharalis and D. canella), now more abundant than 25 years ago. The number of caterpillars and pupae collected by cutting out "dead hearts" was 15,285,960 in 1913, as compared with 13.632.655 in 1912. It is advised that collecting should be commenced at the earliest possible moment, in order to prevent, as far as possible, the complete development of the larvae of the first generation, thus largely eliminating the second and third. On five estates 281,181 eggs were collected. Attention is given to indirect aids to control, prominent among which are: (1) The production of healthy vigorous growing canes, and (2) the use of resistant varieties. To ensure healthy plants, selection of the very best tops only is admissible, and all operations of drainage, tillage, weeding, and manuring must be given careful attention also. The Bourbon cane best fulfils the second condition in British Guiana. Further suggestions are (1) that the trash should not be burnt, and (2) that there should be less ratooning. Termites come next to the small moth borer in point of severity of attack. The weevil borer (Metamasius hemipterus) was present on all estates, but abundant on only a few. Other insects, the occurrence of which is mentioned, are: The coconut palm weevil (Rhynchophorus pulmarum; the hard-back beetles, Dyscinetus bidentatus and Cyclocephala siquata; the shot-horer (Xyleborus sp.); the sugar-cane Aspidiotus (Aspidiotus sacchari); the pink mealy-bug (Pseudococcus calceolariae). A leaf-hopper and a frog-hopper (Tomaspis sp.) were observed in very small numbers. The cane-stool moth, the dead cane moth (Monodes agrotina) and several leaf-eating caterpillars, such as Remigia repanda, Laphygma frugiperda and Lycophotia infecta are also recorded.

SOLANET (L. E.). Déstruction simultanée du Négril et de la Cuscute des Luzernes. [The simultaneous Destruction of Colaspidema atra and Lucerne dodder.]—Montpellier, n.d., 30 pp.

Experiments made during four consecutive years have shown that calcium cyanamide, reduced to the finest and lightest powder possible and applied annually at the rate of 90 lbs. per acre, is an efficacious remedy against both the beetle and the parasitic plant. It does not interfere in any way with the growth of the lucerne. In order to spread such a small quantity of cyanamide uniformly the author advises its admixture with other substances, and gives the following formula: Cyanamide, I part; gypsum, 2 parts; wood ashes, I part.

GOWDEY (C. C.). Report by the Entomologist of the Uganda Protectorate.—Annual Report of the Dept. of Agric, for the year ended 31st March, Kampala, 1913, pp. 29-39.

Insects attacking Coffee. Lecanium africanum, Newst., was the most prevalent scale-insect during the year, attacking both vigorous and weak trees, the latter usually fatally. It is treated successfully with a solution of whale-oil soap at a strength of 1 lb. of soap to 5 gallous of water. Both L. viride, Green, and L. africanum are associated with a black fungus. L. viride restricts its attacks to the under surface of the eaves and to young shoots. This species has also proved susceptible to treatment with whale-oil soap. It is preved on by the Coccinellid

beetle Chilocorus discoideus, Crotch, and parasitised by a Chalcid. Sciencoccus goudeyi, Newst., attacks the young shoots, and is rather difficult to kill without using insecticides at such strengths as to affect the foliage. A large percentage of Pulcinaria psidii, Mask., was parasitised. Ceroplastes ceriferus, And., in addition to coffee, attacks tea, Anona muricuta, Citrus spp., Ficus spp., and Antigonon. The Mediterranean Fruit Fly (Ceratitis capitata, Wied.) in Uganda breeds throughout the year, some kind of food being always available. It has been bred from Anona muricuta, banana, coffee berries, guava, lemon, orange, pine-apple and papava. Of the crickets, Gryllus bimaculatus, de G., and Gryllotalpa africana, P. de B., the latter is the more destructive, particularly so in nurseries with heavy shading. The Coffee Beetle (Stephanoderes Coffeae, Haged) is reported to be causing less loss to coffee-growers.

Insects attacking Cacao.—The scale-insects (Stictococcus dimorphus, Newst.) were parasitised to a greater extent this year by the Noctuid moth, Eublemma costimacula, Saahn. Experiments showed that a spray of 20 per cent, solution of borax was most effective. Plant lice (Aphis sp.) have only been observed to attack cacao from about one to two-and-a-half years old, grown under heavy shade of bananas. They attack the undersides of the young terminal leaves and form a cabbage-like mass. They are always associated with an ant. This aphis is preyed on by the Mantids, Sphodromantis lincola, Burm., and Pseudocreobotra wahlbergi, Stal. The crickets (Gryllotalpa africana, P. de B., and Gryllus bimaculatus, de G.) are eaten by the natives, and hand-collecting has proved successful. The operation can be carried out most satisfactorily by providing hiding places in the nurseries, such as grass or pieces of banana leaves, under which the crickets will hide during the day, and can then be easily collected. The habits of the Cacao Fruit Fly (Ceratitis punctata, Wied.) are similar to those of the Mediterranean Fruit Fly. Ripe fruit is necessary for the eggs to hatch; if, therefore, the cacao pods are picked as soon as ripe the maggots will not be fully grown, thus reducing the number of the adults to infect the next crop. The Cacao Beetle (Adoretus hirtellus, Castn.) seriously injures young trees under about three years old. Sprays of arsenate of lead at the rate of 3 lb. to 50 gallons of water, and of chromate of lead at the rate of 2 oz. to 4 gallons of water are valuable insecticides, and withstand heavy rains.

Insects attacking Cotton.— The Cotton Stainers recorded are Dysdercus nigrofusciatus, Stal, D. pretiosus, Dist., Oxycarenus gossypinus, Dist., O. hyalipennis, Costa. No report was received of damage caused by Bollworm (Earias insulana, Boisd). Only isolated plants were attacked by scale-insects (Pulvinaria jacksoni, Newst.) Several specimens of the parasite, Tetrastichus gowdeyi, Crawf., were bred from this scale.

Insects attacking Tea.—A scale-insect (Aspidiotus transparens, Green) attacks the under surface of the older leaves and covers them. Ceroplastes ceriferus, And., has not been found to be a serious pest.

The report concludes with two tables showing a list of 25 species of ticks found in Uganda, together with their hosts and the diseases that they transmit.

Andrews (E. A.). On Insects. Part II.—Ind. Tea Assoc., Scientific Dept., Quarterly Jl., Calcutta, 1913, pt. 2, pp. 33-42.

In the course of this article the following formula is given for use in the nursery against grasshoppers suspected of injuring the young tea plants: Lead arsenate, 1 lb.; jaggery, 5 lb.; water, 100 gallons. Flooding the nursery for a short time, say half a day, appears to be a practical measure against crickets. Another method of dealing with them is by means of poisoned bait, Lefrov's formula being: Husks of rice, 80 lb.; white arsenic, 2 lb.; gur, 4 lb. When the young crickets first hatch, they stay in the burrow, but after a few days emerge and begin to feed, digging fresh burrows for themselves every night; as they grow older they dig deeper, and eventually adopt a permanent burrow. Crickets do great damage to the tea plants, cutting off the tops of the seedlings and dragging them to their burrows. They also do injury to jute, indigo, rice, and many other plants. Owls and bats consume large numbers of these pests, and heavy rains drive them out of their burrows; when this happens birds destroy great quantities of them. Digger wasps and ants are also to be reckoned amongst their enemies.

URICH (F. W.). The Froghopper Egg-Parasite (Oligosita giraulti, Crawford) and its colonisation in the Cane Fields,—Bd. of Agric., Trinidad and Tobago, Port-of-Spain, Circ. no. 11, 18th Aug. 1913, 9 pp.

The vermilion froghopper egg-parasite (Oligosita g'raulti, Cwf.) has been bred from grass from various localities in Trinidad. From experiments it is found that the most suitable stage of the development of the froghopper egg for the parasite is that in which the embryo is well advanced, and that the larval and pupal stages of the parasite take from 22 to 41 days. The adult parasite is very active, and ever searching for froghopper eggs, passing from one piece of grass to another by little leaps. The multiplication of the parasite is by no means so great as that of the froghopper. However, the eggs of the latter require more moisture to hatch than the parasite requires for its development, so that this is a factor greatly to the advantage of the parasite. Another important factor is that the parasite reproduces parthenogenetically and a female is ready to lay one hour after issuing from a froghopper egg. Parasitism of froghopper eggs under normal conditions is probably about 25 per cent. Colonisation of the parasites in the cane-fields is thought to be best carried out by transferring grass yielding parasites by cartloads to fields harbouring no parasites.

Kershaw (J. C.). Froghoppers.—Bull. Dept. Agric., Trinidad and Tobago, Port-of-Spain, xii, nos. 72 & 73, Aug. & Sept. 1913, pp. 3-12, 95-101, 3 pls.

The growth of the young sugar-cane could be hastened by a fertiliser and the plants would probably hold their own against the nymphs of the froghopper until grown too large to suffer much damage. Nitrolim, a valuable and fairly cheap fertiliser, which is also of some use in killing the nymphs, is therefore worth an extended trial. The planting of trees and shrubs on waste land adjoining cane fields would encourage the spread of the tick bird (Crotophaga ani) and other useful

hirds. In Trinidad the cane fields seem deficient in the various native insects and spiders which prey on the adult froghopper, and the author suggests that in the middle of large fields a small plot of cane be left to provide a refuge and breeding place for them. Carbon bisulphide is unsatisfactory as an insecticide for froghopper nymphs under field conditions, as they are, as a rule, hermetically sealed on the rootlet with spittle, which the fumes can only penetrate with difficulty. To be effective, a very large quantity of the chemical would be necessary and the expense would be prohibitive. If trash is left as long as possible on the fields the parasites have a chance of hatching and e-caping, and the author believes that if the trash is left lying about and not piled up, it is unfavourable rather than otherwise to the froghopper eggs. There are three artificial methods of control, apart from the Green Muscardine fungus, which promise some measure of success, and which are being tried on a large scale at Chagunas: (1) Using Nitrolim as a manure primarily, and secondarily against the froghopper nymphs; it is applied to the roots of the canes by the usual dusters. (2) Kerosene-Lysol emulsion against the adult froghopper. This is very effective if properly applied, as the insect is killed in a few minutes if touched at all by the liquid. Lysol (3 oz.) and kerosene (9 oz.) are mixed in the measure, and then stirred up in 4 gallons of soft water. This 2 per cent, emulsion remains emulsified indefinitely. Kerosene and water is even more effective, but unless continually shaken up will separate almost immediately, and is therefore unsafe for coolie use. When making the experiments an ordinary whisky bottle (27 oz.) was fitted with a cork through which passes a short piece of glass of 1 inch bore, so that it emits a jet, not a spray. A little of the emulsion is shaken into the leaf sheaths where the insects are hiding. This is best done when the canes are small; when they are more than breast-high it will be far more difficult to apply the liquid. (3) After each brood of adult froghoppers, the old leaves on the growing canes should be examined for eggs, and if any numbers are found, the canes should be trashed and the trash taken at once to the cattle sheds for use as litter, when the eggs will soon be destroyed. If the sheds are unable to deal with all the trash at once, it should be stacked on bare ground away from vegetation until it can be used. On some estates it might be possible to spread it on a piece of waste ground and fold cattle temporarily upon it.

The author insists upon the importance of directing remedial measures especially against the first broods of the insect in the spring, but meanwhile (Aug. 1913) he advises the continued and extended use of trap lights for catching the adults, for the damage done to the cane by the sucking of large numbers of adults on the leaves is very great. It is supposed that a loss of 111 gallons of sap per acre is a very conservative estimate, as many of the factors used in the calculation were kept very low. Observations relating to the feeding of the adult froghopper show that in one hour's continuous sucking it voids about 0.75 c.c. of liquid excrement. There is now little doubt that the Syrphid larva, noted by fough in 1910, is largely responsible for the diminished numbers of the third froghopper brood. During the larval stage each of them kills several froghopper nymphs, probably a dozen at least. This Syrphid will be found in all localities, wet or dry, where the froghopper exists.

URICH (F. W.). The Sugar-cane Froghopper and Biological Notes on some Cercopids of Trinidad. Ball. Dept. Agric., Trinidad and Tologo, Port-of-Spain, xii, no. 72, Jan.-Aug., 1913, pp. 12-34, 7 figs., 6 pls., 3 diagms.

This paper is a complete treatise on the Trinidad froghopper. Records of affied species in adjoining countries are given, and may be summarised as follows: In Mexico, Tomaspis postica has been a plague to the grass-lands of the State of Vera Cruz at least since 1880, and is now common in the sugar-cane plantations there. Froghoppers have been found on cane in British Gniana, but so far no damage is reported. In 1883 they appear to have caused some trouble in British Honduras, In Panama specimens of Tomaspis lepidiar were collected on cane, and an undetermined species of Tomaspis was taken in Cuba, but the foodplant is not recorded. In Grenada and St. Vincent froghoppers have been recorded under the name of T. pictipennis. In Suriname T. rubra has been taken on Eupatorium odoratum, and T. pubescens is found on grass. An undescribed species of Tomaspis was found on grass on the Windward (north) side of Tobago.* The subjects next dealt with are the origin and distribution of the insect, food-plants, and damage done. These are followed by a complete life-history. The uncontrolled progeny of a single female during four wet months is estimated at 20,000 adults. Hence the necessity for doing control work early in the season. The conditions favourable to froghoppers are next mentioned, and it is stated that weeding, burial, or removal of trash, and planting of cover crops are valuable remedial measures. Burning the trash is a procedure which proves unsatisfactory. Seventeen enemies are given: Two birds, the Scissors-tail Flycatcher (Milvubis tyrannus) and the Merle Corbeau (Crotophaga and); a ground lizard (Ameira surinamensis); a toad (Bufo marinus); several species of Attidae or jumping spiders; a Mite (Rhyncholophus sp.); Phlingis mantispa; a Mexican Reduviid bug (Castolus plagiaticollis) and the Toad Bug (Galgulidae); several ants. Anochetus inermis, Solenopsis geminata, Monomorium sp.; two species of Chalcididae; a Syrphid fly (Salpingogaster nigra); a Nematode (Mermis sp.); and two fungi (Metarrhizium anisopliae and Empusa sp.). In connection with natural control, the author advises an active compaign against the mongoose, as it is the greatest enemy of the ground lizard, which he thinks is worth far more than birds, so far as the froghopper is concerned. Insecticides form the last subject mentioned, and it is said that several experiments against adults and nymphs were undertaken. but none proved effective,

Mention is made of the fact that besides *Tomaspis varia* the sugarcane froghopper, there are three other species of the same genus occurring in Trinidad. Luckily none of them attack sugar-cane, but as they may be mistaken for *T. varia*, brief descriptions with figures are given of *T. rubra*, L., var. sororia, Germ., *T. pubescens*, F., and *I. guppyi*, sp., n.

^{* [}Since described as T. carmodyi, Kershaw.-ED.].

VASSILLIEV (Eug. M.). Появленіе болье значительных в количествь лугового мотылька и личиновъ свекловичной щитоноски. | The appearance of Phlyetaenodes sticticalis, L., in increasing numbers, and also of the larvae of Cassida nebulosa, L.]—Труды Опытной Энтомологической Станціи Всероссійскаго Общества Сахарозаводчиновь за 1912 г. | Studies from the Expt. Entom. Sta. of the All-Russian Soc. of Sugar-Refiners for 1912. | Kiev. 1913, pp. 31-45, 5 figs.

The author deals with his observations on the habits of Phlyctaenodes sticticalis. In order to prevent the females from ovipositing on the plantations, fumigation by means of smouldering dung, mixed with sulphur, was applied with a certain degree of success. The insects were also caught in fermenting molasses, but it was found out that they are not attracted by molasses in the same way as Agrotis and Mamestra. Oviposition started in the Governments of Charkov and Kiev in the middle of June, and took place chiefly on weeds, and less frequently on the leaves of sugar-beet, both on fresh and dry leaves. The author pays special attention to the plants which serve as food for these polyphagous insects, and he gives a long list of them arranged according to the system of Professor Vettstein, of Vienna. From this he deduces that these pests, belonging to one of the oldest families (Pyralidae) select their food mostly from the oldest orders of plants - Fagales and Urticales and those orders which originated from them; most of the plants attacked belonging to the families Chenopodiaceae and Papilionaceae.

A Sphegid wasp, Ceratocolus alatus, Pz., has been observed to destroy the moths of P. sticticalis by paralysing them and storing them as food for their larvae; the coconns of these wasps are more or less composed of the wings of Phlyctaenodes. Other species of this genus also prev upon Pyralid and Tortricid moths.

*The author points out that it is not sufficient to mow down weeds round the plantations or on fallow land, but that in order to destroy the eggs effectively it is necessary either to spray the weeds before nowing with a 5-6 per cent. solution of barium chloride or with a 5-10 per cent. solution of iron sulphate, or to burn the mowed grass, having poured some kerosene over it.

The females do not oviposit on the plants on which they feed, but always fly for this purpose to fallow fields, where they lay their eggs mostly on *Atriplex*, an average of 26 eggs being found on one plant, this number rising to 60 in some cases.

Vassiliev (Eug. M.). Кормныя растенія нѣкоторыхъ растительноядныхъ насѣкомыхъ и причины, обусловливающія ихъ выборъ. [Plants serving as food for some herbivorous insects and the causes of their selection.]—Труды Опытной Энтомологической Станціи Всероссійскаго Общества Сахарозаводчиновъ за 1912 г. [Studies from the Expt. Entom. Sta. of the All-Russian Soc. of Sugar-Refiners for 1912.] Kiev, 1913, pp. 63-66.

The author refers briefly and in a general way to the relation between insects and their special food-plants, a matter which, notwithstanding its great importance, has been very little studied. A typical instance

of a monophagous insect is provided by the Phyllozera of the vine, while there is not a single monophagous insect amongst the pests of sugar-beet. The author deals specially with Bothynoderes punctiventris, Germ., which, although polyphagous, discriminates in selecting its food. It feeds on plants of the order Chenopodiacae and on one plant of the order Polygonaceae. Of plants of the former order, it feeds on Chenopodium album, L., Atriplex laciniatum, L., Salcola, Beta vulgaris, L., and, according to some statements, on Blitum: of the second order, it feeds on Polygonum ariculare, L. The statements of some authors that they have observed this insect feeding on Nicotiana (Solanaceae) and Cucumis melo, L. (Cucurbitaceae) cannot be accepted as definitely correct without further observations; the author's experiments have satisfied him that it does not feed on plants of the orders Compositae and Papilionaceae. The two orders which serve as food for this weevil are considered to be genetically related, the Polygonaceae being the older and the Chenopodiaceae having probably been derived from them. The author assumes that Bothymoderes punctiventris originated at a time when the connection between these groups was closer, i.e., when there were more intermediate forms between them than at present, and that it fed previously on some species of Polygonaceae, but later adapted itself definitely to the Chenopodiaceae. As to the causes determining the selection of plants, they evidently depend on the physical and chemical qualities of the latter. The author refers to the paper by Verschaffelt, "The causes determining the selection of food in some herbivorous insects." (Kon. Akad, Wetensk, Amsterdam, 1910, pp. 546-542), and suggests that perhaps the results obtained by this author may be utilised in applied entomology for the compounding of sprays for the protection of plants. [Compare also the paper by Dr. I, Trägårdh noticed in this Review Ser. B, i, p. 223.

LEVANDOVSKY (Revd. J.). Пауки—враги пчелъ. [Spider enemies of bees.] «Русскій Пчеловодный Листокъ.» [Russian Bee-Keepers' Gazette.] Moscow, Nov. 1913, pp. 378-387.

The author has paid special attention to this subject, and gives a list of the spiders which kill bees, together with an account of his own observations. The spiders mentioned belong to three families. Thomisus constant, Walck., (T. albus, Gmel.), Misumena ratia, Cl. (Thomisus citracus, Walck.) and Misumena tricuspidata, F. Amother genus of this family of spiders, Xysticus, is beneficial, as it destroys the spiders of the two former genera. The author describes his observations on one specimen of Thomisus citracus, which settled down on a Cheysanthemum corymbosum, L., growing near to a bush of Hesperis matronalis. L., from which the bees kept gathering, and sometimes sat down on the former plant to clean themselves; the spider destroyed five bees in six days, perishing itself afterwards from attack by Pelopaeus pensilis; the sucking of the victim continued for about 24 hours. The author calculates that on this basis, 100 spiders are able to destroy 10,000 bees during four months of the honey season.

The second family is Epeiro Lie following species being known to be injurious: Epeiro diadema, Clerck, E. angulata, Cl., E. cormuta.

Ch. E. patagiata, Ch., E. selopetaria, Ch., Tetragnatha extensa, L., and Miranda acalypha, Walck., the last species having been observed to attack bees only this year. Of the third family, AGELENDAE, only Tenenaria atrica, C.K., is known to the author to prey on bees.

UVAROV (В.). Отравленныя приманки въ борьбъ съ саранчевыми.
[Poisoned baits in fighting locusts.] -Reprint from «Южно-русская С.-Х. Газета». ["South Russian Agric. Gazette,"]
Stavropol Entomological Bureau, Charkov, 1913, 11 pp.

The author refers first to some objections raised against the use of "chemical remedies" (spraying) against locusts on the ground that Stauronotus maroceanus often lavs its eggs in deserts, bare of any plants, thus making it impossible to poison them by spraying, as there are no plants. He is of opinion that locusts very seldom oviposit in deserts, but usually keep near pastures or cultivated land, flying away only short distances to deposit their eggs in steppes; even these steppes provide some food for the hatched larvae in the form of scattered bush plants, which can be sprayed and poisoned, although he admits that in these cases there will be some waste of insecticides. As to places quite destitute of any plants, evidently the larvae must feed there on something, as otherwise they would starve wholesale, and such cases have not been reported up till now. The larvae in such places feed on various foods, horse-dung for instance, which they would not touch under ordinary conditions. Therefore, he suggests the application of chemical methods in those places by providing food and poisoning it, and quotes a work of D. Morosov, published in 1903, who reports the successful use of various poisoned foods, consisting either of lucerne or other leaves, horse dung, or bran, imported into such places for that purpose. He refers to the present use of poisoned bait in America, South Africa, and Australia, and reports briefly on the results obtained by this means in the Government of Stavropol during the campaign against locusts in 1913. To make the food more attractive, the lowest and cheapest grades of molasses were added to the bait. A full report on these experiments will be given later.

Кирыимом (N. V.). Птеромалиды, паразитирующіе на гессенской мушкъ съ описаніемъ двухъ новыхъ видовъ. [Pteromalid parasites of Hessian fly (Mayetiola destructor, Say) with a description of two new species.] Reprint from «Знтомологическій Въстникъ» ["Entomological Herald"], Kier, ii, no. 1, 1913, 4 pp.

Pteromalids are chief amongst the parasites of the pupae of the Hessian fly, but most of the species have not been sufficiently studied. The following have been recorded in Europe: Merisus intermedius, Lind., M. destructor, Say, Micromelus subapterus, Riley, M. rufomuculatus, Walk.. and Holcaeus cecidomyiae, Ashm. In Russia the following species have been reared:—Merisus intermedius, Lind., Micromelus rufomaculatus, Walk., M. subapterus, Riley, Enpteromalus arrensis, sp. nov. and Meraporus crassicornis, sp. nov. The author is of opinion that M. intermedius is a synonym of M. destructor, and that M. subapterus is a synonym of M. pyrrhogaster, Walk., the latter in its turn being only a wingless or semi-winged variety of

M. reformerdiatus, Walk. The last-named species has always been found by the author as a hyperparasite, and he is satisfied that PTEROMALIDAE usually attack the host when it has already passed into the pupal stage. They frequently appear to be hyperparasites breeding on Polygnotus minutus. Lind. A descriptive table of the various species of PTEROMALIDAE is given, and the two new species are described in English. Euperomolus arcensis is a common parasite of Hessian fly in Poltava, Moscow and Kiev, while two females of Meraporus crassicomis have been reared from cocoons of the host in Poltava in 1910, and nine in Kiev.

Tasmanian Insects Pests. Report of the Tasmania Agricultural and Stock Department for 1912-13, Hobart, 15th July 1913, p. 9.

The Director of Agriculture of Tasmania reports that there have been no serious outbreaks of codling moth amongst fruit trees, and the slight outbreak of San José scale in the city of Launceston has been so successfully dealt with that not an insect, dead or alive, was found. The trees received two good winter sprayings with line and sulphur wash, and every tree on which the live scale was found in summer was also treated then with the sulphide of soda spray. The work was carried out thoroughly, and many gardens in which the scale was found last year and which were treated are now perfectly clean.

METCALE (C. L.). The Syrphidae of Ohio, Ohio Biological Survey, Bull, 1, Ohio State University, Columbus, Ohio, xvii, no. 31, June 1913, 122 pp., 3 figs., 11 pls.

This is the initial bulletin of the Biological Survey of Ohio, the object of which is to secure accurate and detailed information as to the occurrence, distribution, and ecology of the animals and plants of Ohio. The bulletins will be published at irregular intervals, as the investigations are completed. This volume is divided into three parts. The first covers the following headings: General discussion of the family; general characters: an evolutionary table of larval habits: biological and ecological relations and economic importance of the larvae; ecological relations and economic importance of the adults; enemies and practical measures. The common milkweed (Asclepias sp.) is a rather formidable enemy of the adult Syrphidae, as their legs are eaught by the pollinia of this plant; thus large numbers of the weaker bodied flies are entrapped. The parasitic insects of the family ICHNEUMONIDAE are also serious enemies of Syrphidae, at least of the Aphidophagous species. At times fully 75 per cent, of the individuals collected were destroyed by these parasites. Minute Chalcid parasites also prev upon the larvae of Baccha babista. Something might be done towards increasing the number of these valuable insects if people could be brought to see that Syrphidae, both as larvae and adults, are among our most valuable friends. Part 2 contains a key to known larvae and pupae of Syrphidae, synopses of life-history studies, and a review of the literature on the biology of the family. Finally. Part 3 gives a key to the genera, a list of Ohio species and 8 brief bibliography,

FLETCHER (T. B.). Note on Insects Attacking the Paddy Plant in Southern India. Madras Dept. Agric. Bull., Madras, iii, no. 67, 8th Apr. 1913, 10 pp., 10 figs., 2 pls.

ORTHOPTERA: Hieroglyphus banian, F., occurs in all rice-growing tracts throughout the plains of Southern India. The eggs are laid in masses in the ground, usually between October and December, the young emerge about June, and become mature in about 70 days in the case of males, or 80 days in the case of females. This insect feeds on paddy, sugar-cane and maize, but chiefly on paddy, of which it is a major pest, doing serious damage, both in the adult and hopper stages. The best remedial measure seems to be the catching in small bagnets of the young hoppers soon after they have hatched out. Oxya velox, F., is a smaller grasshopper than H, bandan, and its life-history is not known in detail. It feeds on paddy, cholam, sugar-cane, etc., and is usually a minor pest of paddy. It is often found in company with H. bandan, and may be controlled in the same manner by sweeping in bag-nets. The adult grasshopper is sometimes attracted to lights at night, and trial of light-traps is indicated in cases where damage is being done.

Coleoptera: Epicaula sp. This is a small Cantharid beetle, found as a local pest of paddy in South Kanara in October, eating the flowers and also attacking ripe ear-heads. The life-history is not known. Collection of the beetles by hand or in small hand nets is indicated as a means of control. The Galerucid beetle, Oides affinis, Jac., has been found at Shoranur (Malabar), in July and August. His status as a pest is doubtful, at most it seems sporadic and local, Leptispa pygmaca, Baly, a minute Hispid beetle is found chiefly in South Kanara, Malabar, Mysore and Cochin, usually in July and August. The eggs are laid on paddy leaves, and the grubs feed on their upper surface, the attacked leaves usually folding over and hiding the enclosed grub, which, when full-fed, pupates on the leaf, the beetle emerging after about four days. The beetles also eat the leaves, although to a less extent than the grubs. This insect may be a serious pest, and is said to be worst in wet weather. No successful remedy has been devised so far, but bagging by hand-nets may be tried. Hispa armigera, Oliv. (aenescens, Balv), occurs in all the ricegrowing tracts of Southern India, and becomes sporadically a serious pest of paddy. The eggs are laid on the leaves, in which the grubs tunnel, producing discoloured patches, and ultimately pupate in the leaf. No satisfactory remedy has been found so far, but catching the beetles in nets is suggested. Calandra oryzae, L., the rice-weevil, can scarcely be considered a pest of paddy, although occasionally found in the field on ripe ear-heads, but it is a serious pest of stored rice.

LEPIDOPTERA:—Melanitis ismene, Cram., is found throughout Southern India, occurring from sea-level to elevations above 7,000 feet. The pale green caterpillar feeds chiefly at night and sometimes attacks paddy, but as a rule doe; very little damage. Parnara mathias. F., the rice-skipper, occurs throughout the plains of Southern India, but is a minor pest of paddy, as a rule, its numbers being kept in check by various parasites and predators. The caterpillar lives in leaves rolled longitudinally. P. colaca, Moore, has been found on paddy at Saidapet and Madras, but is not a regular pest. Another

skipper, Telicota augias, L., is a minor pest of sugar-cane, but is stated to feed on bamboo and paddy. It has not been noted as doing any real damage. Cirphis unipuncta, Haw., the army-worm, occurs throughout Southern India, chiefly in October and November. The caterpillar is a minor pest of cholam, occasionally attacking paddy, maize, etc. Protection of cultivated tracts by digging narrow steepsided trenches around them is usually the only practical measure to prevent attack when the caterpillars are swarming. Spodoptera mauritia, Boisd., occurs throughout Southern India, and the caterpillar sometimes does considerable damage to seedling rice-plants. The eggs are laid usually on the under-surface of blades of grass or paddy, in batches covered by buff-coloured hairs from the female moth. The caterpillar feeds at night, and when full-fed pupates in the soil, the moth emerging after about ten days. In the case of small areas, such as seedbeds, the following control measures may be adopted: (1) Protection of seed beds by surrounding them with narrow steep-sided trenches; (2) collection of egg masses: (3) spraying; and (4) flooding of area and turning in ducks. This last method is used successfully in some districts. Sesamia inferens, Wlk., occurs throughout Southern India, the caterpillar being a bad pest of ragi, and often found as a minor pest of maize, cholam, paddy, wheat and sugar-cane. The caterpillar bores inside the stem, pupating in the larval burrow. The attacked plants show dry ears, and destruction of these is indicated to prevent extension of the attack. Remigia fragalis, F., is occasionally a very minor pest of paddy throughout Southern India. The caterpillar feeds exposed on leaf blades. Pselis (Dasychira) securis, Hb., is a minor pest of paddy throughout the plains of Southern India, Pupation usually occurs on a leaf-blade in a cocoon formed of silk, interwoven with larval hairs; the pupal period is about ten days. The caterpillars are conspicuous and feed exposed, and are therefore easily collected by hand. Ancylolomia chrysographella, Kollar, is found, throughout Southern India, the caterpillar feeding on paddy, Paspalum dilatatum, and probably on all grasses. It has only been found on one occasion as a serious pest of paddy seedlings, but is liable to occur af any time in dry sandy localities. The pale green caterpillar feeds at night, remaining during the day in long tubular galleries lined with silk at the roots of its food-plant. Pupation occurs in the larval gallery; the pupal period is about ten days. Control measures include (1) flooding of affected areas to bring up the caterpillars, which are greedily devoured by crows, etc.; (2) spraying of plants (in small experimental areas, seed-beds, etc.); and (3) attraction of moths by means of light-traps at night. Schoenobius bipunctifer, Wlk., the paddy stem-borer, occurs throughout the plains of Southern India as a very serious pest. The eggs are laid on leaves in clusters, covered with yellowish hair. The caterpillar bores into the stems of the paddy and pupation occurs in the larval burrow, which is lined with silk. The moth emerges through a hole previously cut by the caterpillar through the side of the stem. No really successful controlmeasure can be given as yet, but to reduce the damage the following means are suggested: (1) Ploughing and, if possible, burning of paddy-stubble after the harvest is gathered: (2) collection of eggmasses, which are conspicuous; and (3) attraction of moths to lighttraps at night. Nymphula depunctalis. Gn., is a serious pest of paddy

throughout Southern India. The caterpillar is semi-aquatic, living in cases made of rolled pieces of leaf, and is furnished with bunches of slender filamentous gills along the sides. It crawls up the plant above water-level and feeds on the green tissues of the leaf. Pupation occurs in the larval case. Draining the water off the affected fields is indicated as a remedy, but this is rarely possible in practice, as this pest is chiefly found in low-lying, water-logged areas. In some districts, a thorny bush is dragged over the field to dislodge the larval cases, and the water is then drained off; it is, however, difficult to see what is the value of the thorny bush, and the draining of the water is evidently the important factor where success is claimed for this method. Unaphalocrocis medinalis, Gn., occurs throughout Southern India, and is a minor pest of paddy as a rule, occasionally doing considerable damage in the Northern Circars. It is not known as a pest in the southern parts of Madras. The caterpillar lives inside folded leaves, of which the tip is fastened over the broader basal part; it eats the leaf tissue so that the leaves become whitened and sickly. No remedial measures, applicable on field scale, can be suggested at present.

THYSANOPTERA: -Various species of Thrips occur on paddy, but they have not been worked out.

RHYNCHOTA: -Menida histrio. F., is found throughout Southern India as a minor pest of paddy; also on wheat, cholam and pulses, Collection by hand-nets is indicated in the case of small areas. Tetroda histeroides, F., has been found at Salem and Coimbatore as an occasional minor pest of paddy. Collection by hand and by hand-nets is suggested on small areas. Leptocorisa varicornis, F., the rice-bng, occurs throughout Southern India as a serious pest of paddy, especially on the West Coast. The eggs are laid in rows on leaves of paddy and grasses. The bugs especially attack the ripening grain, sucking the milky juice, so that the ears turn wholly or partly white, no grain being matured. Collection in hand-nets has been found the most efficient method of control. Tettigoniella spectra, Dist., a small white Jassid, occurs throughout Southern India in paddy fields. It has not actually been noted to be a pest, but may at times do some damage. The adults are strongly attracted to light at night, and this fact may be utilised as one means of control. Nephotettix bipunctatus, F., occurs on paddy on the plains of Southern India; it is probably a minor pest. The adults also fly freely to light.

Thrips and Cacao Beetles.—Bull. Dept. Agric., Trinidad and Tobago, xii, no. 72, Aug. 1913, pp. 66-70, No. 74, Oct. 1913, p. 136.

Mr. Rorer furnishes the following report on the cost of spraying caeao. Against Thrips it is necessary to spray both leaves and pods, and the figures given are for this method. A barrel outfit, costing about £10, or a set of compressed air knapsack-sprayers, costing about £20, will, under favourable conditions, spray about 500 trees a day; so if it is necessary to spray 1,000 a day, from £20 to £40 must be invested in apparatus. One man should spray at least 75 trees a day, or 100 if they are small, and if facilities for spraying are good, so that 15 men should be well able to cover 1,000 trees a day. The cost of the spray mixture itself depends on the materials and quantity used. Bordeaux

mixture costs about £1 13s. per 1,000 gallons, or £3 6s. if 80 lb. of arsenate of lead are added. One per cent. lysol costs about £2 per 1,000 gallons, and nicotin sulphate solution about the same. Kerosene emulsion is still more expensive. On the average, three-quarters of a gallon of spray mixture is required per tree, so that 1,000 gallons will cover 1,300 trees. These figures work out approximately at a maximum of £3 per 1,000 trees per application. Spraying with Bordeaux mixture alone is much cheaper than this. All things considered, the cost per 1,000 trees would be about £2. This can be reduced by one-half or two-thirds if the fruit alone is sprayed. The carao spraying experiments were showing up well this year: not only were the sprayed trees yielding better, but there was very little black carao, while in unsprayed places the percentage of black carao was very high.

Mr. Urich has noticed that when a certain insecticide turned out to be good, and a demand was made on it, it generally gave out, and much time elapsed before more could be had, even if telegraphed for. That especially applied to lysol. A search is being made for natural enemies of the cacao Thrips, and one may be found in Trinidad or some other island. Later on, Mr. Urich reports a decrease of the insects, but recommends a careful watch for their appearance on the pods. As soon as this takes place the pods should be sprayed. Thrips

yield to good cultural methods very easily.

The ravages of the cacao beetle (Stirastoma depression) are quite as bad, if not worse, than those of Thrips. Energetic application of trapping, and spraying with arsenate of lead is recommended. Arsenate of lead can also be very well applied to small trees with a good-sized paint-brush.

At the September meeting of the Board of Agriculture, Mr. Urich stated that he observed but few Thrips on his recent visits to the districts of Sangre, Grande, and Caparo, nor had he any reports of their prevalence in numbers in other places. The rains appeared to be

keeping them in abevance.

Adult cacao beetles were just appearing, and it would be well to collect and trap them before they had time to lay eggs. In places where Thrips or cacao beetles are known to be troublesome, spraying should be carried out during October. For Thrips it is recommended to use Bordeaux mixture and lysol in the proportion of one to two gallons of lysol to every 100 gallons of mixture. For cacao beetles Bordeaux mixture with 4 to 8 lb, of arsenate of lead to every 100 gallons of mixture should be used.

ROBER (J. B.). The Green Muscardine Fungus.—Bull. Dept. Agric., Trinidad and Tobago, Port of Spain, Sept. 1913, xii, no. 73, p. 105.

A point of great economic importance is that infections with the disease can be brought about as early in the season as the froghopper appears. The author saw dead froghoppers of the first brood covered with the fungus two weeks after the spores were applied, and this was much earlier than he ever observed natural infection taking place. He mentions that a few fungus cultivating cabinets have been constructed in Porto Rico, where certain beetles which attack sugar-cane

are found to be killed by this fungus. This is also the case in Illinois, where it is used to combat an insect pest of Indian corn. In Illinois a trial is being made of burying the fungus in the soil.

Two Useful Spray Fluids,--Ind. Tea Assoc. Scientific Dept. Quarterly Jl., Calcutta, 1913, pt. 3, pp. 79-84.

Bordeaux mixture attains its maximum efficiency when the copper sulphate and lime (calcium hydrate) are mixed in the exact proportions necessary to form copper hydrate. Any excess of either constituent impairs the activity of the mixture, and loss of efficiency means loss of money. A properly made mixture may be much more efficient than a carelessly made one containing double the percentage of materials. Besides being the best general fungicide, it improves the health of the plant, and it has been proved that its use on leaves and fruit intended for human consumption is in no way detrimental to the consumer. The following quotation from the eighth report of the Woburn Experimental Fruit Farm (1903) explains very clearly the best method of making this mixture at present invented:

One hundred gallons of such mixture is prepared as follows: Dissolve 6 lb. 6½ oz. of crystallised copper sulphate by suspending it in a piece of sacking in two or three gals, of water in a wooden or earthenware vessel. Take about 3 lb. of good quicklime and slake it in a little water, then put it into a tub with 120 gals, of soft water. Stir the lime and water, then leave it to settle until the liquid is quite clear. Run off 86 gals, of the clear lime-water and mix it with the copper sulphate. Make up to 100 gallons with soft water. However the Bordeaux mixture is made, it is important to make sure that all the copper is thrown down. The most certain test that fruit-growers can use is to put a few drops of a solution of potassium ferrocyanide into a white saucer with some water, and to drop into this some of the clear liquid after the Bordeaux mixture has settled. A red or brown colour shows that there is copper in solution, and more lime water must be added until the test shows no coloration."

Originally used as a sheep-dip, lime-sulphur has been proved to be one of the hest fluids for winter application to dormant trees, both as a fungicide and as an insecticide, and it has the additional advantage of stimulating the growth of the plant. The lime used should be the best commercial quicklime (stone or lump stone); air-slacked lime is useless. It is most undesirable that more than five per cent. of magnesium oxide be present. To test the amount of impurity in quicklime, the following simple method is useful. The apparatus required consists of (1) a glass cylinder about 21 inches in diameter and 15 inches high, which should be graduated in cubic centimetres, and (2) a boiling vessel to hold about three pints. A quart of water should be poured into the vessel, and the level at which it stands should be marked on a piece of stick held vertically; then pour out the water. Weigh out carefully 2 oz. of the lime to be tested, place in the vessel and slake with water, adding the water gradually, not covering up the lime with it until the slaking is complete. Then stir the slaked lime into a paste with more water, continuing to add water until the level marked on the stick is reached, and then boil. Weigh 4 oz. of flowers of sulphur and stir vigorously into the boiling lime-water.

Boil gently for one hour, filling up to the mark with more water every ten minutes, stir quickly and pour into the glass cylinder. Allow it to stand overnight, and then measure the amount of the sediment in cubic centimetres. In the following figures, given by the author, the first represents the number of cubic centimetres of sediment, the second the appoximate percentage of impurity, the third the weight of the lime used, necessary to replace effectively 36 lb. of pure lime: 30–5 per cent. 38; 50–10 per cent. 40; 70–15 per cent.—42; 90–20 per cent. 45; 105–25 per cent. 48; 120–30 per cent.—51. The standard formula given is: best commercial quicklime, 36 lbs. finely divided sulphur, 80 lbs.; water, 80 gallons. It is unwise to use lime containing more than 10 per cent, impurities, as the sediment clogs the spraying machines.

Another Cockroach Poison. -Agric. News, Barbados, 27th Sept. 1913, p. 314.

Under the heading Insect Notes, there is given a formula recently tried in Barbados with apparently very good results. It contains naphthalene and boric acid in equal parts, the naphthalene being finely powdered before being mixed with the boric acid. This mixture has been sprinkled plentifully in the haunts and hiding places of cockroaches at intervals of about two weeks, and after two or three applications the insects almost entirely disappeared.

The following abstracts are taken from the monthly journal « Туркестанское Сельское Хозяйство» — [Agriculture of Turkestan], published at Tashkent.

Notes on insect pests. Agriculture of Turkestan, no. 6, June 1913, pp. 585-590.

An editorial note deals with the multiplication of Stauronotus maroceanus in the province. This pest has all but disappeared since the campaign of 1911, and no damage by it was reported during the last three summers. Gradually, however, the broods of the remaining locusts it is impossible to destroy all the insects without a single one being left—have increased, and in 1912 although no swarms were noticed, their egg-clusters were found in various localities. In the province of Samarkand it was necessary again to organise a campaign against them in some places, and their egg-clusters were also discovered in the district of Tashkent, which will necessitate renewed efforts in fighting them next year.

In South Eastern Bokhara the record in 1912 proved the existence of egg-clusters over an area of 274 square miles, and £32,500 was assigned to fight them. The use of the new insecticide, sodium arsenate, gave excellent results: portable iron sheets were also very useful. A field telephone was also brought into use for the first time, and greatly facilitated the communications between the separate parties. The insects are reported to have been destroyed by Pastor roseus (Rose Starlings). No migrations of the pests from Afghanistan were noticed this year, owing firstly to the gradual decrease in their numbers in that country, and to the fact that this year they flew to the south, in

the direction of Kabul; thus the campaign ended with great success, No damage to crops was done, and only small numbers of locusts

as in Turkestan in 1911.

Coloptenus italicus appeared in many parts of Turkestan, and also great numbers in the streets of Tashkent. Some damage to wheat 1048 was done by this pest near the river Kashka-Darya, and Asservations have shown that about 80 egg-clusters were laid on onete foot. Serious damage to crops was also done by this locust in someony with Arcyptera truchmana in the settlement Novo-Michaelovsk, situated on the left bank of the river Tchirick. Another note relates to migatory locusts (Locusta migratoria), which hatched in 1912 in great numbers in their usual breeding places, the districts of Perovsk and Kazalinsk and the delta in the Amu-Darya. Notwithstanding the great numbers of eggclasters there was no outbreak of these locusts in the district of Perovsk, owing to the overflow of the Syr-Darya during this spring when the clusters evidently were destroyed. According to statements from competent sources, it is hardly possible to fight this insect in these parts of the country, owing to local conditions, and usually no remedies

According to a statement by M. M. Siazov, Epicanta crythrocephala; which is very useful, as its larvae destroy egg-clusters of locusts, has done some damage to crops in the current year (1913), as well as last

hear. Potatoes and clover seem to have suffered most.

It appears that very few pests of field crops have been noticed this year, and neither the larvae of Caradrina nor those of Hylictus, which injure cotton seeds and tomatoes, occurred in quantities worth mentioning, except on one estate where the last-named pest appeared, but was successfully destroyed. Pests of orchards were very active, and Cydio pomonella, C. funebrana, Rhynchites auratus, Pollyphylla adspersa, various plant lice, etc., did much damage as usual.

SMIRNOV (D.). Борьба съ персиковой тлею, термитами и муравьями при помощи карболинеума. [The fight against Lachnus persicae, Chol., termites and ants by means of carbolineum.]—Agriculture of Turkestan, no. 8, August 1913, pp. 783-786.

The author records his attempt to control Lachnus persicae, an aphis which does great injury to peaches in the Murgab estates, by smearing carbolineum over the trunks and over the larger injured branches of the trees. This was done in December, and in the case of ten trees the smearing was applied too thickly, so that the author was obliged to wash a part of it away with kerosene; the further development of the trees was not satisfactory, and out of 16 smeared trees only 11 recovered, four recovered only partly, and one died. The author explains these unfavourable results as being due to the carbolineum having passed through the bark into the cambium, plurging the vessels. He is of opinion that the smearing ought to be done during the vegetative period in March and April and during wet weather.

He further reports excellent results obtained by him in his house by using carbolineum against termites and ants (Hodotermes turkesturicus, Jacobs, and Camponotus maculatus turkestanicus, Em.). These insects evidently cannot stand the smell of carbolineum, and by smearing it over the wooden parts of the buildings, especially in places where the exits of the insects are situated, he was able practically to free his house from them.

An editorial note to this article calls attention to the fact that in the author's experiment with carbolineum on peach trees he brought in accidentally another material—kerosene—and it is not proved which of the two was injurious to the trees. [See this *Review*, Ser. A. ii, p. 67]

Parasites of Chloridea and the Codling Moth,—Agriculture of Turkeston, no. 8, August 1913, pp. 810-813.

An editorial note deals with a parasite of tomato-worms, under which name the caterpillars of Chloridea are popularly known in Turkestan. Near Tashkent tomatoes were seriously damaged during last year (1913) by two species of Chloridea, C. obsoleta and C. dipsacea: there was also a caterpillar of a third species which remained unidentified These caterpillars are very injurious, feeding day and night on the fruit. S. N. Bogoliubov, from the Entomological Station, has been studying these insects, and found a parasite of them. The name of the latter is not given, but a description of it is supplied; the females kill the caterpillars with their ovipositor, feeding on their blood and depositing eggs on the killed insect. The parasites prefer the blood of fresh victims and pass from one caterpillar to another. In the laboratory some females have killed as many as eight caterpillars during their life and deposited on them about 100 eggs. The development of the parasite from egg to imago lasts eight to fifteen days, thus a large number of generations is bred during one summer. Males of this parasite were also noticed. It is suggested to assist the breeding of these parasites by keeping the dead caterpillars, found near tomato bushes in a box with a wire-netting lid, so as to enable the hatched parasites to escape; such a box should be put in a tomato field on a sheet of glass or other support, protected by varnish from ants, A more detailed report is expected from Bogoljubov after the conclusion of his observations.

Another note relates to the parasite of the egg of *C. pomonella*, imported in 1911 by Radetzky from Astrachan [*Trichogramme scublidis*.] Last year (1913) they were found by Troitzky in many orchards of Tashkent, besides those in which they were released in the preceding years. In 1912, Plotnikov found these parasites in Ferghana, where no imported specimens were released. In 1913, they were found in the districts of Samarkand and Ferghana. Whereas the parasites in Tashkent are exclusively parthenogenetic females, in Ferghana both sexes are found, and the parasites hatch from fecundated eggs; the parasites in Samarkand, where also both males and females are found, differ in colour.

It is reported that in the garden of the governor of Ferghana, where enormous quantities of these parasites were found, and where in the first half of July all the eggs of *C. pomonella* were infested by them, there were also found large quantities of caterpillars of the codling moth. The information obtained will decide the question as to whether the imported parasites have been able to acclimatise themselves in Turkestan or whether there are local representatives of them.

MIROSHNITCHENKO (A.). Истребленіе шершней и осъ на пасънахъ и виноградникахъ. [Destruction of hornets and wasps in beebives and vineyards.]—Agriculture of Turkestan, no. 9, September 1913, pp. 931-934.

The author suggests a new method of destroying wasp-nests, which he has applied with success. He used a soldering lamp, which gave a dame of about 5½ inches long. By directing the flame into the nest, it was possible to remove the latter, and also to destroy it, by burning at with the same lamp, without being subjected to strings from the insects; the strong glare keeping the wasps back and not allowing rhem either to protect themselves or to escape. The author has destroyed in this way 111 nests of wasps without being stung.

It appears from the author's remarks that wasps are a most serious pest in that country and, according to statements of persons knowing south European Russia and the Crimea, there is no place where wasps are so abundant as in Turkestan.

PLOTNIKOV (V.). Pachydissus attacking Poplars,—Agriculture of Turkestan, no. 10, October 1913, pp. 1038-1040.

In reply to a correspondent who sent in an insect pest which has done great damage to poplars and other trees in Kokanda, the author identified the species as *Pachylissus sartus*, Sols., and gives information as to its habits. As a remedy he suggests cutting out and burning the damaged trees; the remaining trees must be kept in a healthy state, and any parts of them damaged from other causes must be smeared over with carbolineum, tar or pitch, adding creosote or carbolic acid.

Demabin (P.). Личинки щелиуна, какъ вредители хлопчатника. (Larvae of a species of Elateridae as posts of cotton.)—Agriculture of Turkestan, no. 10, October 1913, pp. 1040-1041.

The author reports damage done to cotton by larvae of a species of ELYTERIDAE. He first noticed this on the 21st April in a cotton plantation in the district of Samarkand; the larvae gnawed through the collar of the root in plants which had already spronted, also injuring the cotyledons of seedlings. The plants suffered most in their first two stages, while later they were better able to withstand the attacks of the posts. On the date given, the larvae were found at a depth of $2\frac{1}{2}$ 3 inches below the surface of the soil; on the 11th May they stopped injuring the plants and were found at a depth of 4- $4\frac{1}{2}$ inches; esurches made in the first half of June resulted in no larvae being found, they having evidently passed to a considerable depth into the earth.

SEVASTJANOV (J.). Кровяная тля и мѣры борьбы съ ней. [Ert-osama (Schizoneura) lanigerum Hausm., and remedies against it.] - Agriculture of Turkestan, no. 11, November 1913, pp. 1103-1128, 10 figs.

The author starts with a general historical review of the spread of this pest, and particularly in Russia, where it appeared first in the (CH) B 2

Crimea in 1862, spreading in the seventies of the last century to Sotchi and thence to Transcaucasia. As to European Russia, the special investigations conducted by the Ministry of Agriculture in 1896 in the Governments of Bessarabia, Cherson, Podolia, Ekaterinoslav, Taurida, Charkov, Poltava, Kiev, Volhynia, Tchernigov, Kursk, Orel, Smolensk, Mohyley, Poland, and the Don district, showed a total absence of the insects in those areas, its habitat being thus limited to the Crimea and the Caucasus; indeed, fruit-growers in South-Western Russia have often received young apple trees infested with these plant-lice, but the latter have disappeared. The author quotes Mokrzecki, according to whom these lice are less injurious in the Crimea than in Western Europe, which he explains by the fact that in the former country the development of the pests is checked by the unfavourable weather conditions, which the insects meet with in a greater degree the further they move towards the east. Other authors, however, consider these lice to be very injurious, and Rollov, who studied the insects of the Caucasus, gives instances of young trees attacked by E. lanigerion, perishing in two to three years, while the yield of fruit on older trees attacked was gradually reduced to nothing. In 1896 special regulations were issued in the Crimea as to the fighting of E. banigerum; these regulations empowered the District Zemstvo of Simferopol to deal with this question through a special committee appointed by the Zemstvo and special superintendents in various districts; they made the notification of the appearance of these pests compulsory upon the owner of an orchard, and while leaving to him the selection of proper remedies, empowered the district superintendent to act on account of the owner in case the latter failed to take the necessary measures, or if the remedies applied by him proved of no effect. They further prohibited the sale and export of trees from nurseries attacked by the pests, and authorised the Zemstvo to destroy trees which, in the opinion of the district superintendent, could not be saved.

As to Turkestan, the appearance of E. lanigerum was mentioned in the report of Plotuikov for 1911, and although the injuries done by them are less than those done by other sucking insect pests, there are signs that they are increasing, and they may prove very injurious in the near future. The author thinks that it would be premature to compel the native population to take drastic measures against these lice, as this may have an opposite effect, by creating mistrust of the entomological organisations of the country, which, up till now, have been able to interest the native population in their activity. He addresses himself to the Russian population, urging the necessity of applying energetic remedies during the coming winter.

The author goes on to describe the insect in its various forms, and its bionomies, and points out that there are no parasites known to destroy them. Their known enemies are the larvae of some rapacious beetles, especially lady-birds, and he quotes a statement by Shevirey, who observed the destruction of whole colonies by the larvae of Enpaactis chrysorthea.

As preventive measures he suggests the disinfection of nursery stock with carbon bisulphide, describing the method of application, and also the keeping of the trees in a clean healthy state by scraping off the dead bark, smearing with milk of lime, manuring of slow-growing

trees and taking care to smear any wounds on the trees with tar or some greasy material. He recommends the destruction by burning of infested branches or trees, whenever possible, if the trees attacked are not too valuable to be destroyed, and the destruction of the lice by crushing them, even by hand; insecticides may be usefully applied late in autumn and in winter when the lice lose their "down." crashing the lice with brushes, the use of a poison -Xessler liquid is recommended, as described by Mokrzecki (about 51 oz. of green soap, a quarter of a pint of amyl alcohol, one-eighth oz, of carbolic acid, and eight pints of soft water). When the lice are discovered on the poots, the latter may be safely sprayed with this mixture, or, as recommended by Rollov, the earth round the trees must be dug to a depth of about 3-31 feet, a solution of milk of lime in water poured over the roots, the latter being afterwards covered with slaked lime and earth. Smearing with carbolineum, and spraying with kerosene emulsion and with quassia is also recommended; for kerosene emulsion the following recipe is given by Plotnikov: 13 oz. of caustic lime, 3 lb. of kerosene, and 2.7 gals, of water. Radetzky has recommended smearing the trees with a solution of $\frac{1}{2}$ $\frac{3}{4}$ lb. of naphtha soap in 2.7 gals, of water.

A list of eleven Russian works on the subject concludes the article.

CRAWFORD (D. L.) Control of the Orange Maggot (Trypeta ludens). -Mexico Gulf Coast Citrus Association, Tampico, Circular no. 1, 17th Sept. 1913, 5 pp.

The nest known as Trupeta ludeus, or the orange magget or fruit fly. is a very serious one. Its attacks are not limited to citrus fruits, of which the following have been found to be infested: Grape-fruit, navels, Boone's Early, Hart's Late, tangerines, citrons, sweet limes and souroranges. The eggs are laid within the skin of the fruit in a small puncture made by the ovipositor of the female. They hatch in about ten days, and the tiny maggets eat into the pulp, decay sets in and the truit drops. After three weeks inside the fruit the maggots work their way into the ground and pupate, and the fly emerges nearly a month later. From egg-laving to the emergence of the adult occupies about three months. The control method already practised, frequent collection and destruction of the fallen fruit, is effective to a certain extent, but poisoned baits should also be used. All fallen fruit should be buried in a deep pit and covered with at least two feet of soil. Burning the fruit is more satisfactory, provided it be done thoroughly, for the maggots are very resistant to heat. Incinerating furnaces are the best for this purpose. The formula for preparing the bait spray is as follows: 6 lb, of dulce syrup (thick), 1 lb, of arsenate of lead poste). 20 gals, of water. If this cannot be obtained, the following substitute may be used: 1 lb. of white arsenic, 4 lb. of sal soda asshing soda), and I gal. of water. Boil these ingredients in an iron vessel for about twenty minutes, or until dissolved. The liquid thus made is arsenite of lime, and must be diluted. It is less satisfactory than arsenate of lead, because it is washed off the trees more easily. This stock solution of arsenite of lime is to be used as follows: 6 lb. of dulce syrup (thick), one pint of arsenite of lime, 4 lb, of freshly slaked lime. and 20 gals, of water. The lime absorbs any free arsenic which would injure the foliage. One pint of the liquid is sufficient for one tree, and it may be sprayed on the lower and middle branches and fruit. If there is no rain, the bait will last effectively on the trees for about tendays. Success largely depends on applying the spray for the first flies, as well as for the last ones.

ASHBY (S. F.). Annual Report on the Department of Agriculture for the year ended 31st March 1913.—Januaica, Kingston. 1913. p. 30.

S. F. Ashby reports that scales have been severe during the drought, on orange and grape-fruit. The two most destructive scales were the purple mussel scale (Lepidosaphes beckii) and the citrus snow scale (Chionaspus cite) on trunks, branches and twigs mainly. Of less importance on leaf and fruit, were the red scale (Aspidiotos articulatus and the red spot scale (Chrysomephalus aonidam). The purple scale widely parasitised by a Chalcid (Aspidiotophogus citrious, Crwf),, and in wetter districts by the "red-headed fungus" (Sphaerostilbe voccophala).

PIERCE (W. D.) The Occurrence of a Cotton Boll Weevil in Arizona. Jl. Apric. Research, Washington, i. no. 2, 10th Nov. 1913, pp. 89-96, 9 figs. 1 pl.

In February 1913, an insect resembling the cotton-boll weevil was found breeding in the bolls of a wild shrub known as Thurberia the spesicides in Ventana Canyon, Arizona. In May, the author obtained a large quantity of heavily infested bolls of Thurberia from the lower part of Stone Cabin Canyon, Arizona. A close examination of the material disclosed many minor points of difference from the usual form of the cotton-boll weevil. Anthonomous grandis—Boh. In addition to these differences of structure, certain differences of habit were noted; it was found, however, that A. grandis would feed upon Thurberia, while the Arizona species would equally feed on cotton; and it was possible to obtain crosses of the two forms. It is therefore, decided to regard the two as being merely different varieties of the same species. For the Arizona variety the name, Anthonomus grandis thurberine, var. n. is proposed. A systematic description and an account of the life-history are given.

The Arizona weevil may be able to cover considerable distances by flight, especially if compelled to seek sustenance elsewhere. It will however, probably cleave to its native food-plant so long as this gives sufficiently abundant food, but should the supply for any reason become scarce, it is to be feared that the weevil will take to cotton, to which it would do considerable damage. It is thought that a whole-safe destruction of the native food-plant might merely cause the insect to turn its attention to cotton. The matter is now under investigation, but at present it is the author's opinion that the safest plan is to preserve the states quo of the weevil in the mountains. An introduction of parasites from the cotton boll weevil would be of considerable assistance in reducing the Arizona weevil, and would not cause its dispersal.

The cotton boll weevil has never been able to invade successfully

the dier cotton sections of western and north-western Texas, although it is probable that it will gradually adapt itself to the more rigid conditions obtaining there. It is of extreme importance that the Arizona accept be kept out of western Texas and any part of the south-east. If accidentally introduced into other sections, there is reason to believe that it might be able to stand much greater variations of climate than Anthonomus grandis, and become a much more serious pest.

р. PROVLIANSKY (V. V.). Нъ біологін тлей плодовыхъ деревьевъ и ягодныхъ нустовъ. [On the Biology of Aphis pests of tree and bush Fruit.] Кіевская Энтомологическая Станція при Юмно-Русскомъ Обществъ Поощренія Земледѣлія и Сельской Промышленности. [Pubd. by the Kiev Entomological Station of the South-Russian Agricultural Syndicate], Kiev, 1913, 48 pp.

This memoir is the result of observations on aphids collected by the cyclor during the summer of 1912 around Kiev; his primary object being the study of the life-history of Aphis point, de G. He first gives the following list of aphids found on certain fruit trees, but does not chain that it is exhaustive. On fruit trees of the genus Picus: -M. . is mali, Ferr., M. pgrimus, Ferr., M. pgravius, Pass., Aphis pomi, 3. G. A. fitchi, Sand., A. sorbi, Klt., A. cratacgi, Klt., A. pyri, Koch, Schwood at a langera, Hausm., S. pyri. Goethe. Rhitoctowns ampelinus, Hory .. Phyllogera piri, Mokr. On fruit trees of the genus Praicus : --Plandon hamali, Schr., Rhopalasi pham persicae, Sulz., Mysus cerasi, F. Haclapterus prani, F., Aphis pranorum, sp. n., A. pranina, Walk., ... isina, Walk., A. persicae, Klt., A. prani, Koch. A. prunicola, K': Luchnus persione, Chol. On bush fruit of the genus Ribes: Residusi pham ribis, L., Mysas ribicolas, Klt., M. ribis, L., Aphis Adrine, Klt., Schizoneura almi, L., (fodiens, Buckt.), S. grossun. Schule. On bush fruit of the genus Rabas: Macrosiphom c. Klt., Aphis idaci, Goot., A. articaria, Klt., A. mordwilkiana, sp. n. Agais point. The author found these aphids mostly on apple and post trees; also on white thorn, Cydonia culgaris, Pers., (quince), Mespelas germanica, L. (common medlar), and on Cotoncaster vulgaris Landl, (medlar var.) On apple and pear trees they first suck the buds, then the lower sides of young leaves and shoots: from June onwards they are found mostly on the lower sides of leaves of apple, while on year trees they are found less frequently; in the autumn they were bound only on the leaves of apple. The development of the larvae, from birth till after the last moult, occupied 2 weeks in April, while 29 May and in June it was only 10 days. The number of larvae prodirect by each parthenogenetic female was 25-30, in the case of wingbecomens, and 20 25 in the case of winged ones, their natural enemies the author records, Exochoneus quadripustulatus a April, while in June larvae of another ladybird were found, as well is these of Syrphid flies; in July and August the larvae were destroyed by the larvae of Bremia, as well as by Coccinella 11-panetata, L., in Algust. Some specimens were infected by a parasite, and the author 2011 some secondary parasites: Pachyneuran aphidis, Bouché, the select applications, Mayr, and Lygorerus sp. The author is satisfied il that there is no total disappearance of these aphids from apple trees the summer, but that they pass their whole life-cycle on them; (2) that it is most unlikely that any migrations take place; (3) that the decrease in their numbers depends upon the decrease in the fertility of the viviparous females; dissections of females taken at different periods of the season have shown that their fertility remains constant from May to July, while it decreases by one-half in August.

Aphis sorbi was rare. The author did not find them on cultivated fruit trees, although other observers report that they attack apple.

Aphis reatuegi. According to Mordvilko this species migrates during the summer from the white thorn to certain grasses which serve as intermediate hosts; the second generation consists almost exclusively of winged migrating females, which start a new generation on Rammentos. These were previously considered to be a distinct species. Aphis ronancali, Klt. The author's observations have contirmed the statements of Mordvilko. Besides white thorn, he found the stem-mothers also on apple trees. On the same trees he found also inside some curled leaves, aphids which strongly resembled specimens of A. cratacqi, and which were described by Kaltenbach as a generation living specially on apple trees. According to Mordvilko A. cratacqi migrates also to Aethosa (fool's parsley). The damage done by the form found on apple trees is very great. The author reared from the stem-mothers of A. cratacqi, a parasite, identified by Kurdjumov (by whom all the other parasites mentioned were also identified as Ephedrus bicertosus, Hal.

Phorodon humidi lives on thorn bushes, on Primas insidicia. L. (hullace), and on plum trees, migrating to Humidus lipidus, L. (hops). At the same time the author found that some individuals pass the whole summer on plum trees. Those found during the summer on hops are exclusively wingless females, only the last generation, consisting of winged specimens, migrating back to the plum trees. These aphids do not visibly injure plum trees, but cause great damage to hops, being the most dangerous pest of these plants.

Myzus cerusi was found by the author during the whole summer, after 9th June, on cherries, there being practically no winged females. His observations did not confirm the statement by Kessler that these aphides migrate in the summer, although he is unable definitely to dispute this statement. The damage done by them to cherry trees is very great, when they appear in large numbers. The author found the following insect enemies: Latvae of a Chrysopid, of Bremia and of Syrphid flies: imagos of Coccinella bipunciala, L.; he found also empty skins of aphids, from which some parasite had emerged.

Hydlopterus pruni. The anthor confirms the discovery by Mordvilko that this is synonymous with H. arandinis, F., which is found in summer on reeds, to which they migrate from plum trees, returning to the latter in autumn. Some, however, do not migrate at all, so that from June to August they can be found on both the primary and intermediate host plants. Besides plum trees they are also found on apricots, peach trees, thorn-bushes (Prunus spinosa, L.) and on Prunus insiticia, L. The sucking of these aphids affects the leaves but little, but they assist the development of a fungus (Capnodium salicinum, Mont.), and cause considerable damage by attacking unripe fruits at the beginning of summer. These aphids were found to be destroyed by Syrphid larvae and by those of Brenia; many specimens

were infected by Praon flavinode, Hal., out of some of which the author neared a hyperparasite, Lygocerus sp.

Aplas pronocum, sp. nov. These were identified by Mordvilko as a ew and undescribed species, and the author gives descriptions of the singed and wingless parthenogenetic female, larvae, nymph, and sovial female. He found large colonies of these insects on a young. green shoot of an apricot tree on the 6th June, consisting of wingless temales, nymphae and young larvae; on the 9th July they were

found, mostly as winged females, nymphae and larvae of all stages, on leaves of apricot trees; on the 22nd July only winged females and aynohae were found, and from the 29th July till the 9th September no specimens could be found on any plants; on the last date they were again observed on leaves of plum trees, where they were found until the 30th October. Evidently they migrate in the summer to some

intermediate host plants.

Aphis pruni. The author found larvae and wingless females on young leaves of plum trees on 29th May, but by the end of July the msects had entirely disappeared from these trees, being found instead on Cynoglossum officinale, L. (dog's tongue) during July-August. But the author is satisfied that these two, A. cardni, L., and A. proni. Koch, are synonymous, and that the latter form migrates in the summer to some intermediate host plants, returning in the autumn to plum. He further thinks that it is probable that the species described by Koch as A. jacobaeae, Schr., A. symphyti, Schr., A. chrysanthena, Koch. and A. carsellae, Koch, are all synonymous with Aphis cardui, L. s. mani, Koch. A. pruni also occurred on young shoots of apricot trees, as well as on Prunus spinosa, L.; a large proportion of those found on the latter plant were infected by the parasite, Lysiphlebus (Aphidius) cardai, Marsh.

Rhopalosiphum ribis. The author's observations again confirm those of Mordvilko, to the effect that this species migrates in the summer from its chief host plant, black current, to various species of Souchus sow thistle). He found many enemies and parasites of these flies; they were devoured by larvae of ladybirds and of Syrphid flies and by bugs of the genus Anthocoris: he also reared the parasites Prion coloure Hal., and Ephedrus lacertosus, Hal.: from these parasitised specimens the hyperparasites, Pachyneuron sp. and Lygocerus sp., were also

Myzus ribicolus. The author's attention was called to this species only in the autumn, when he found them on the 6th September on black current; he failed to distinguish them in the spring, owing to their similarity to Rhopalosiphum ribis; they were not to be found on currents during the summer.

Myrus ribis. These were found during the whole summer and autumn on black and red currents. They do not harm black currents. but produce bright red protuberances on leaves of red currants. The author found that they were destroyed by larvae of one species of Syrphid, and by those of the Bremia; a considerable number were infected by Lysiphlebus (Aphidius) ribis, Hal.

Aphis grossulariae. According to the author these are the most injurious of all the currant aphides; he found them from the 23rd April to the end of October. The following enemies of these lice are reported: Syrphid larvae, larvae of Bremia, the beetles Exochomus quadripastalatus, L., some preduceous bugs, and the parasite Lysiphlebus condui, Marshall, var.; the latter playing an important part in the destruction of the insects.

Schizoneara almi. These lice were found in May on Ulmas effusa, Willd., and on Ulmas montana, With., in galls on the leaves; the second generation consisted of winged females, which migrated during June to the roots of red and black currants (Sch. fodiens, Buckt.). In September and October the winged sexes flew back to the chief host plants. The author states that they are distinctly injurious to currants when present in any numbers. The only remedy is to remove all elim trees from the orchards attacked, as they winter on elms, and cannot exist without them.

Min rosipham rabi. This species was found in July, and afterwards during the whole summer and autumn on leaves of raspberry bushes, but always in small numbers. No damage by them was noticed.

Aphis idaei. Found on raspberry bushes in May and during June; they disappeared afterwards. The damage done by them to raspberries is great.

Aphis mondedhiana, sp. nov. This new species was found by the author in September underneath leaves of raspberry bushes. He thinks it probable that the lice were there before, but were not distinguished by him from larvae of Macrosiphum rubi, Klt., which they resemble at first sight. They rested on the leaves singly, chiefly along the veins: underneath one leaf some dozens of specimens were found. All the specimens noticed were wingless females and their larvae: no winged females, nymphae, or males were found. On October 15th, the author found groups of eggs of this species on branches of raspberry bushes, near the buds. The majority of the eggs had already turned black, but freshly laid eggs, as well as ovipositing females were also found.

PARKER (W. B.). Flour paste as a control for red spiders and as a spreader for contact insecticides. -U.S. Dept. Agric. Burean Entom., Washington, Circ. no. 166, 30th Jan. 1913, 5 pp., 2 figs.

Flour paste is not only a suitable "spreader" for lime-sulphur solutions, but it apparently serves, to some extent, as an active insecticide. Each gallon of paste contains 1 lb, of flour, and the addition of four gallons of paste to 100 gallons of lime-sulphur causes the spray to adhere to the leaves as a thin film, increasing its efficiency almost threefold, mainly owing to the spreading effect of the paste. A series of trials was made with nicotin sulphate against the hop aphis (Phogodon humoli) in which flour paste at the rate of four gallons to 100 gallons of the nicotin sulphate solution at strengths of one in 2,000. and one in 3,000 was employed. In these trials from 99 to 100 per cent. or the aphides were destroyed. It was observed that many of the smaller aphides were pasted on to the leaves. Accordingly, flour paste without any other insecticide was tried, and when used at the rate of eight gallons (8 lb, flour) in 100 gallons of water or even stronger (s.iv. i) 100 or even 12 100) most of the young and tender aphides 497 per cent.) and of the red spiders (Tetranychus bimaculatus) were killed. No damage was done to the hop plants, even when in full The older and stronger aphides, and the eggs of the red spider, not killed by the flour paste. To deal with the latter, it was found recorder to make a second application, seven or ten days later, in added to reach the mites that emerge from the eggs. In a series of five exteriments against red spiders on hops with flour paste at the rate of > 100, it was found that from 99.8 to 100 per cent, were killed. This paste solution is exceedingly cheap. It has been used successfully against red spiders on beans, chrysanthemums, hops, cucumbers (in greethouse and field), pumpkins, pears, prunes, roses (in field), and Violets (in greenhouse and field). The chrysanthemum leaves may became spotted if spraying is done too near the time of blooming. Floar paste was not satisfactory when used upon greenhouse roses and carnations or field sweet peas. To prepare the flour paste, mix a closed grade of wheat flour with cold water, making a thin batter, without lumps, or wash the flour through a wire sieve with cold running water and make up to one gallon of water to each 1 lb, of floor. With constant stirring to prevent burning and caking, cook until the paste is formed. It will be necessary to add sufficient water to balance loss in evaporation. Ineffective spray is due to insufficient cooking, When overcooked, the paste hardens when quite cold and cannot be with mixed with water. Usually, overcooking is not disadvantageous. In the spray tank the paste tends to settle, and the solution must be againsted to ensure good results, but it shares this slight disadvantage with most materials. It is a most effective spreader for lime-sulphur and micotin sulphate sprays, is easily obtainable, and has no odour like 6sh-oil soap. Used alone at a strength of 8 100, it is effective egalist several leaf-feeding mites and some very delicate aphides, From observations made during four months, it seems possible that their paste may be useful as a spreader for lime-sulphur for scale-insects and fungi, and as a "sticker" for arsenicals.

Prohibition of Removal of Certain Diseased Plants. Proclamation of
• the Governor of South Australia, Adelaide, 15th May 1913.

The Covernor, with the Executive Council of South Australia, by vartue of the provisions of "The Vine, Fruit and Vegetable Protection Acts, 1885 and 1910." prohibit the removal of citrus trees or the fruit of citrus trees from any part of the State into a stated portion of the Marray Valley (25 miles on either side the river), and also declare that to citrus trees or fruit shall be removed between the areas described unless examined by an inspector and declared free from red scale Applitudes coccineus), and all such trees or fruit must be despatched in our cases or packages. Such consignments on arrival at their destination are to be re-examined by an inspector before delivery to the integrate.

Important Amendments to Codling-moth Regulations. Fruit Removal Regulations (Proclamation No. 20 of 1913).—Agric. Dept. of Union of S. Africa, Pretoria, no. 16, 6th May 1913, 10 pp.

By Proclamation 20 of 1913, Proclamation No. 38, dated the 22nd February 1912, is superseded and repealed. The regulations applying to vines, grapes and mango trees are unaltered, while the change with

respect to apples, pears and quinces, is that of omitting a number of districts from the area of the Cape Province, into which the removal of these fruits has been prohibited for the past seven years. Care is necessary to avoid the removal of prohibited fruit into "protected" portions of the Union, and every wrongful removal is to be reported to the Magistrate of the district in which the offence occurred, and the consigner and consignee may both be punished. The protected areas are enumerated, and removals are not allowed from one protected area into another. The removal of boxes, etc., that have been used for the storage or conveyance of apples, pears, and quinces into areas into which the removal of these fruits is prohibited is illegal. The return into a protected area of boxes, etc., that have been used for the conveyance of any of the fruits named, to any place outside of that area is not allowed. It is also illegal to use second-hand apple-barrels. pear-boxes, etc., for the sending of any produce into a protected area. Travellers by train and cart would be violating the restrictions if they took any prohibited fruit into a protected area. The removal of the restricted articles through a protected area in direct transit by rail or post from a place outside of it to a place outside of it, is allowed. The object of the regulations is to check the spread of codling-moth into parts of the Union which are still supposed to be free from this pest, and which are considered generally suitable for the culture of apples or pears. The contraction of the protected Cape area was prompted by the presence of the pest in many places within the parts now omitted from the protected area. The presence of the pest, to a very small extent, is suspected in many places within the still protected areas. and as a check on its spread from sources within, the Government issued Notice 366 of 1912. The effectiveness of these various measures in retarding the spread of the codling moth will depend to a great extent on the alertness of parties within the protected regions in detecting and reporting any infringements. Besides repealing Proclamation No. 38 of 1912, Proclamation 20 of 1913 also announces certain restrictions as to the removal of grape vine, virginia creeper. ampelopsis or other plant of the natural order, Vitaceae, or any living portion (except seed), or fresh food of any such plant, and of any mango trees or any portion thereof (except the fruit), and of apple, pear or quince fruit in its fresh state. The areas protected and not protected in respect of these different fruits are set out, as also the various lines of railway along which the transit of the plants and fruit mentioned in the amendment, may or may not be carried.

FULLER (C.). The Wattle Bagworn.—Agric, Jl. of Union of S. Africa. Pretoria, vi, no. 2, Aug. 1913, pp. 198-217, 9 pl.

The present paper is a continuation of that which appeared in Vol. 5, No. 6 of the Agricultural Journal of the Union of S. Africa [see this Review, Ser. A, i, p. 303.] The life-history of the wattle bagworm (Chalioides junoti, Heylaerts) is given. The male moths begin to emerge, and the females become adult during July. In August egulaying begins, and towards the middle of the month the young larvae appear. By September egg-laying is finished, the adult moths die off, and the main brood of young emerge from the maternal bags. In the

months from October to February the larvae feed and grow, the preatest damage being done from November to January. In March the larvae discontinue feeding and prepare to pupate, the males first, and larer the females; pupation occurs during April, May and time. Although in the caterpillar stage no difference between male and female is evident, the pupae differ markedly. The adult female is a segmented spindle-shaped organism, bearing no resemblance to a moth, having neither wings nor legs. She never leaves her bag, and in this some 600 eggs are laid, in a mass of wax-like secretion mixed atth scales.

Shortly after the eggs hatch, the young larva, instead of beginning at once to feed, drops from the base of the bag, supported by a gossamer strand, and sways about in the air, until it comes in contact with some object on a lower plane; it then ascends its strand again and remains upon it for a day or two, making no attempt to feed, however mear food may be. The author suggests that this is a device to aid in the dispersal of the species; birds flying through plantations would be apt to pick up on their beaks, feet or feathers, the glutinous gossamer threads to which the insects are attached, and the insects would thus be deposited in another locality. This habit of the larvae may account for their spread by the wind, which would transport the leaves to which the threads are attached.

WARREN (E.). On the Economic Value of Wild Birds.—Agric. Jl. of S. Africa, Pretoria, vi, no. 3, Sept. 1913, pp. 461–465.

The author points out the immense value of birds as destroyers of injurious insects, ticks, etc., and contends that the benefits they confer upon the stock-farmer and agriculturist, far outweigh the relatively small amount of damage they may do, except in the case of a few species. He then mentions a number of useful South African birds, giving a general indication of the nature of their food. It is pointed out that in many parts of South Africa the lack of cover and widespread grass fires are very prejudicial to bird-life; and farmers are urged to pay some attention to the needs of birds. Strips of bush should be reserved as cover, and in open country trees should be planted in the vicinity of cultivated lands, so as to furnish suitable breeding places; for it is when birds are feeding their young that they are specially active in destroying insects.

LOUNSBURY (C. P.). Pernicious Scale.—Agric. Jl. of S. Africa, Pretoria, no. 4, Oct. 1913, vi, pp. 662-670.

It is now a little more than two years ago that Pernicious (San José) Scale, which has the reputation of being the most serious of all the numerous scale pests of deciduous fruit trees anywhere in the world, was discovered to be present in South Africa. The Government at first decided to attempt the eradication of the new pest by burning infested trees and plants. Owing to the immensity and cost of the undertaking, the Government, in April 1912, decided to leave the eradication or suppression of the pest on any particular property to the enterprise of the occupier or owner. The dissemination of the pest was due wholly, or in large part, to purchases of trees from one

nursery at Pretoria and one at Pietermaritzburg, and had been going on at least since 1906. The response of the occupiers to the appeal for suppressive action was, on the whole, gratifying, but many took no action at all, and others sprayed to little effect, probably owing to slovenly application. Lime-sulphur wash and "Scalecide" havboth proved highly efficient as spraying fluids. One thorough spraying every winter is evidently all that is required to prevent damagto a tree; but two or three thorough sprayings in one winter may be necessary to get the pest well under control in the case of trees which have been allowed to become badly infested by neglect in one or more years. The measures that the Government is applying to prevent the rapid dissemination of the insect are chiefly those relative to nurseries and plant traffic, intended to check the spread of plant pests in general. Special instructions were given to railway and postal officials, who send non-certificated plants to an Agricultural Department plant inspector for examination before they are forwarded for delivery. Special legislation applies to Pretoria, it being illegal to remove any plants from the town without the written permission of the Department of Agriculture. It is also illegal to remove any woody plants from a property known to be infested with the insect anywhere in the country. A general inspection was made between August 1911 and April 1912, and the towns and places where the pest was found are given, and in a general way, the position in July 1913. The towns and places inspected are in the Transvaal, Orange Free State and Natal.

MARTELLI (G.). La lotta naturale contro il Crisomfalo (Bianca-rossa), gli Afidi (Formichedda), la Mosca (Verme) delle arance, delle pesche ecc. e la Mosca (Verme) delle olive. [Use of natural enemies against Chrysomphalus, Aphididae, the Mediterranean Fruit Fly and the Olive Fly.] Giann. Agric, Mexidionale, Mrss. o. vi. nos. 8-9, Aug.-Sept. 1913, pp. 137-142.

The successful introduction of Norius cardinalis against Icerqui purchasi, Mask., in the province of Messina and elsewhere, and the possibility of obtaining good results with parasites of other injurious insects led the Cattedra ambulante d'Agricoltura in Messina to introduce as many of such enemies as possible. It is due to F. Silvestri that the Coccinellids, Rhizobius lophantae, R. centralis and Oreas chalybaeus, which prev upon Chrysom phalus and other injurious Coccids. and Hippodamia convergens, an enemy of aphids, have been imported He also brought two other parasites: Galesus silvestrii, Kief, and Dirhinus giffardii. Silv., into Italy to combat the Mediterranean fruit !lv. and then found that they would breed in the olive fly. It is therefore hoped that these parasites will be efficient against both these pests in peach, orange, and olive-growing districts where the soil is loose and sandy. As yet it is not known whether the parasites will become acclimatised, but from the Naples district, where some of them were introduced some time ago, the reports are most satisfactory.

BALLOU (H. A.). Report on the prevalence of some Pests and Diseases in the West Indies during 1912.—West. Ind. Bull., Barbados. xiii. no. 4, 22nd Sept. 1913, pp. 333-357.

The information presented in this report covers most of the

agricultural pests and diseases in the West Indies. An easy form of telerence is provided by tables showing the observations of their ecurrence and non-occurrence. The insect pests referred to are as follows:—

Cacao pests:—Thrips (Heliothrips rubrocinctus, Giard), noticed in Grenada, St. Vincent, St. Lucia, Dominica, St. Kitts; cacao heetle Strastoma depressam, L.), in Grenada; scale-insects and mealy bugs of Grenada, Dominica, St. Kitts, Virgin Islands; the greengrass bug Nyara cridula, L.), in Grenada; Aphis in Nevis.

Coconut pests: Weevil (Rhynchophorus palmaram, L.) and white fly Abgrodicus cocois, Curtis), in St. Vincent; coconut snow scale (Diuspis boisdived), Sign.), glassy star scale (Vinsanat Abfrea, Westw.), Bourbon aspidiotus (Aspidiotus destructor), occunat meady bug (Pseudocucus nipuc, Mask.), and green scale tracus ciridis, Green) in Grenada, St. Vincent, St. Lucia, Antigna, St. Kitts, Nevis, Virgin Islands: termites in Nevis.

Indian corn pests: Corn ear worms (Chloridea obsoleta, F., and Laphygnon frugiperda, S. and A.), in St. Vincent, Antigua, St. Kitts, Nevis, Virgin Islands; hard-back grubs (Lachnosterna), in Antigua. The ripening heads of guinea-corn were attacked by caterpillars (not described) in Montserrat,

Cotton pests: The cotton worm (Alabama argillacea, Hb.), noticed in St. Vincent, St. Lucia, Montserrat, Antigua, St. Kitts, Nevis, Virgin Islands: the boll worm (Chloridea obsoleta, F.) and Laphygma (raqipeda, S. and A., in Antigua; the cotton stainers (Dysdevens indicae, L., and D. delannegi, Leth.), in Grenada, St. Vincent, St. Lucia, Montserrat, Antigua, St. Kitts, Nevis, Virgin Islands. Scalenisets (Saisselia nigra, Nietn., and Hemichionaspis minor, Mask.), in Grenada, St. Vincent, Antigua, Nevis, Virgin Islands; the flower-buld alagent (Contarinia gossipii, Felt), in Montserrat and Antigua; the haf-blister mite (Eriophyes gossipii, Banks), in St. Vincent, St. Lucia, Montserrat, Antigua, St. Kitts, Nevis, Virgin Islands; a hard-back beetle (Cycloeeplala dimidicata) in Grenada; a small bronze beetle and a long (Edessa meditabranda), in St. Vincent; cotton aphis (Aphis gossippi, Glover), in Montserrat, Antigua and Nevis.

Pests of green dressings: Pigeon peas were attacked by the beetles Beachus chinensis and B. quadrimaculatus, in Dominica; a caterpillar known locally as the Bengal bean worm) attacked horse beans in Mentserrat and cowpeas in Antigua; a weevil (Excephthalmos curiens, Boh.) was found on pigeon peas in Antigua, where Barbuda beans were infested by an aphis.

Pests of limes and other citrus trees:—Scale-insects, especially Coccus viridis, Green, are still doing much damage in St. Vincent; ill the commoner kinds occurred in St. Lucia, the green scale (C. viridis) and the snow scale (Chionaspis citri, Comst.) being the most troublesome. One or two outbreaks of scale-insects were reported from Dominica; the purple scale (Lepidosaphes beckii, Newm.) and the green scale were noticed in Montserrat, where for the first time limes are seriously attacked by the West Indian red scale (Chrysomphalas secrentii, Mask.). The lantana bug (Orthezia insignis, Douglas) is very carce in Montserrat; scales were common in Antigua; they are shandant wherever there are lime trees in St. Kitts; green, purple and snow scales occurred in Nevis; white scale and purple scale in

the Virgin Islands. The bark-borer (Leptostylus praemorsus, F.) was noticed in St. Lucia; the twig-borer (Elaphidion mite, Newm.), in Antigua; the fruit fly (Ceratitis capitata, Wied.), in Dominica.

Sugar-cane pests: The moth borer (Diatraea succharalis, F.) noticed in Grenada, St. Lucia, Antigua, St. Kitts, Nevis: the weevil-borer (Metamasius sericeus, Oliv.), in St. Lucia, Antigua, St. Kitts; the root-borer (! Exophthalmus esurieus), in St. Lucia, St. Kitts; termites in St. Kitts; hard-back grubs (Luchnosterna spp.), in Antigua, St. Kitts, Virgin Islands.

Sweet potato pests: Horn-worms (Protoparce cingulata, F.), in Antigua and Virgin Islands; the scarabee (Cryptorhynchus batatae, Waterh.), in Grenada and St. Kitts; the red spider (Tetranychus telarius, L.), in St. Lucia, Antigua, and Nevis; a white fly (species unknown), in Grenada.

Yam pests: The yam scale (Aspidiotus hartii), in Grenada; the scale that occurs on the stored tubers was observed in St. Kitts.

It is stated that the canes on one estate—the locality of which is not given—were infested with shot-borer, wherever the attacks of rind fungus, and other fungus diseases occurred severely. Grasshoppers are a great pest in many districts, especially in dry localities, and flocks of gninea fowl are successfully kept for the purpose of controlling them.

Regarding parasites of injurious insects, it is stated that Cepholosporeum fungus has done good work on the mango shield-scale in Grenada, and Sphacrostilbe has increased rapidly in the St. David's district, Grenada. In St. Vincent and St. Kitts, Chaleis sp. and the Jack Spaniard wasp (Polistes annularis) control the cotton worm to a noticeable extent, and planters are encouraging the wasps by erecting rough shelters for them in or near the cotton fields. The white-headed, black-headed, and red-headed fungi parasitised the scales on line trees in St. Lucia, and, although not so general, the buff shield-scale fungus was well established in some districts. In Antigua, parasitic fungi on scale-insects are much more common than was realised some time ago. Lady-birds are increasing on some lime plantations.

MacDougall (R. S.). The Large Narcissus Bulb Fly (Merodon equestris, Fab.)—Jl. Board Agric., London, xx, no. 7, Oct. 1913, pp. 594-599, 2 figs.

The narcissus fly, first recorded in England in 1869, is responsible for a great destruction of narcissus bulbs in different parts of the country. In addition to bulbs of the genus Narcissus, the larva has been found in bulbs of Amaryllis (Adams), Habranthus (Chittenden), Vallota (Chittenden and Theobald), Eurycles (McLachlan), Lilies (Wilks), and Galtonia (Theobald). Theobald found the larvae at work (at Wve and in Devon) in the bulbs of the Wild Hyacinth (Scillandans), and, partly on this, bases his opinion that Merodon equestris is native to England. The larvae tunnels and feeds in the bulb, which may be so spoiled that it rots away completely. In other cases flowers and weakened plants may be produced, but no new bulbs. It is often difficult to say without opening the bulb that a Merodon grub is present within, but in typical cases the infestation can be recognised by the bulb "giving" on being squeezed between the finger and thumb.

Treatment:—(1) Failing bulbs and plants should be removed from the beds and destroyed: (2) destruction of all decayed and infested with at the time of lifting and also, especially in case of importation, come planting: in daffodil-growing grounds, where some years ago the bolom was proving a great pest, the persistent examination for, it destruction of, sickly bulbs has resulted in its being the rarest currence now to find a Merodon: (3) sifting the surface layers of the sul, where this is practicable, for pupae; in Holland the surface twees are searched about the time that the plants are coming into desert: (4) steeping the bulbs in water for from two to eight days, order to drive out and drown the larvae: a number of experiments show that while good results may follow, there are failures also: (5) eaching the flies with hand-nets: this is a valuable measure.

Theobald, in his second British Museum Report (1904), recorded the inding in bulbs of narcissus of another Syphid larva, which proved the Emerius strigatus, Fall. It infests onions, shalots and the bulbs of the hyacinth, either alone or along with Merodon. A number of Emerius larvae may be present in a single bulb. Infested bulbs become discoloured, and rot away. The author has found numbers of Sciura larvae in bulbs of Glory of Leiden and Duchess of Westminster, and has at different times bred species of several genera of Mycetophilidae from decaying bulbs.

Piexen (F.). Le Cleonus mendicus et le Lixus scubricollis, Charangons nuisibles à la Betterave dans le midi de la France. [Cleonus (Temnorrhinus) mendicus and Lixus scubricollis, Weevil Pests of Beetroot in the South of France.] -Bull. Soc. d'Etude et de Vulgarisation Zool. Agric., Bordeaux, xii, no. 5, Oct. 1913, pp. 129-137, 1 pl.

Though not so largely grown as in the North of France, beetroot is also cultivated in the Mediterranean region, where its pests are generally of species different from those found in the northern provinces. Though the black aphis (Aphis enonymi, F.), and the beet fly (Pequain hyoscyami, Meig.) occur nearly everywhere, the flea-beetle Charlicuma tibialis, Illig.) and the beet moth (Phthorimaea occilatella, Boyd) become commoner as one advances southwards. The weevils, Temmorchinus mendicus, Gyl., Bothynoderes punctiventris, Germ., and Letas scubricollis, Boh., are exclusively southern species. Valéry Mayet has studied T. mendicus thoroughly, but Lixus scabricollis and its habits are nearly unknown. After emerging in autumn the adult Temporthinus passes the winter underground and appears in April or May. The date of its appearance depends solely on climatic conditions, and thus all the beet fields are invaded simultaneously. If alternate crops are grown the weevils travel immediately to the new ground, and apparently by their sense of smell. The eggs are laid in the ground near the collar of the plants, and by the end of May almost every adult is dead. Because of its earthy colour and its habit of remaining under clods or close to the plant the insect is not always noticed by cultivators, and even a severe infestation can only be detected by a careful examination. On hatching, the larva tunnels the surface of the young root. Later on the hole is increased in size, is not made deeper. The work tends downwards, and only the

underground portion of the root is attacked. At the end of September many larvae are still present in the roots, but pupae and some adults also are to be found. The latter either remain in the pupal chamber or emerge into the open. On warm sunny days they may be seen feeding on the leaves. Collectors consider T. mendicus to be rare, but ? fairly overruns the beet-fields of the Agricultural School at Montpelliein Hérault. In 1913 all the roots there had been attacked. The necessity for a mild climate and compact clay soil limits its spread, by beetroot can only be successfully grown in a loose deep soil. Wherever Temporthinus finds its favourite plant under the above conditions, speedily develops into a terrible pest. In Russia and Hungar B. pinctiventris and B. belavorus, Chev., are only too well known The former is also a southern species, but is rare in Hérault, as is requires a sandy soil. Many Cleonids living on Salsolaceae will attach beetroot. Thus Temnorchinus brevirostris, Gyl., is a species found on the Mediterranean coast on Kelp (Salsola) and on Atriplex. So far it has not been found on beetroot, but Chromoderus fasciatus. Mill. (albidus, F.), which is common on Atriplex, Chenopodium, Salsola, etc. has been reported as a beet pest in Central Europe. Though vers abundant in Hérault, the author has not observed it in the beet-field. there. As regards Cleonus piger, Scop. (sulcirostris, L.) most writers notice it as a beet pest, but one of little importance. Indeed the author believes it not to be such. Temporthinus has few enemies; 100 Hymenopterous parasite is known, but Sphegids of the genus Cercenprey on it, though not to any great extent. In pursuing his investigations on Cocobacilli as insect parasites the author found one of these bacteria in the larvae of T. mendicus, which he provisionally named Bacillus cleoni. It remains to be seen whether it differspecifically from Bacillus cajae discovered in Arctia caja by G. R. Blat-

When the larvae have penetrated into the root the damage is partenedy. The adults must be destroyed when feeding, prior to oviposition. Valery Mayet recommended arsenicals, and especially a solution of 5 oz. sodium arsenite in 20 gals, of water, to which 2 be of flour had been added to make it adhere. The ordinary arsenate of lead sprays may be used also. Spraying must be done beforeviposition takes place, and beetroot sprayed in April can be fed to cattle in October without any danger whatever.

Lixus scabricollis, Boh., is practically of no economic importance. It is parasitised by a Braconid of a species as yet unknown, but which the author will describe shortly. L. ascanii, L., and L. junci, Dahl. have long been known as beet-feeders, but they also seem of little importance. They are sometimes found on spinach.

FEYTAUD (J.). Les Hémérobes ou Chrysopes [Chrysopa.]—Bull. Sod'Etude et de Vulgarisation Zool. Agric. Bordeaux, xii, no. 5, Oct 1913, pp. 138-148, 3 figs.

The Chrysopa most common in France are C. vulgaris, Schn., C. perka. L., C. septempunctata, Wesm., and C. aspersa, Wesm. C. eulgaris, which may be taken as a type, is pre-eminently carnivorous. Already known as a destroyer of Aphids, the perfect insect has been also observed killing the caterpillars of Polychrosis botrana. The egg is

attached to a stem about 6 or 7 mm. long, which the female produces prot to laying. The larva is very agile and even more voracious than the adult. Chrysopa are mostly known as enemies of aphids, but according to Schneider they also prey on the larvae of Muscidae and Colcoptera. In the vineyards, Chrysopa also attacks Phylloxera a its stages above ground, and here again the larva is the chief destroyer. Fuschini has calculated that one larva can devour about 6,000 eggs, besides causing the indirect destruction of those contained in the ovaries of the female. The larvae of Nephopteryx divisella, Dp., and Hylotoma rosae, F., also fall a prey to Chrysapa. C. vulgaris has been described as an enemy of the Vine Tortrix ("Pyrale" de la vigne) throughthira pilleriana, Schiff.) In 1911, the author reported an abundance of Chrysopa in the south-eastern vineyards, which had been invaded by the Microlepidoptera of the vine, and showed clearly that Clysia ambiguella, Hb., and Polychrosis botrana, Schiff., were destroyed by Chrysopa larvae, and even by the adults. Experiments conducted in 1913 showed that a single larva could eat about 60 Polychrosis caterpillars, at the rate of 3 or 4 a day. The agriculturist should therefore learn to know and protect so helpful an anxiliary. The author very strongly recommends that all traps baited for the moths of Polychrosis be emptied and cleaned immediately they cease to be useful, as Chrysopa are also taken in them. Indeed it has been found that they capture Chrysopa more often and in larger numbers than Polychrosis, thus doing a great deal of harm. Birds, especially night hirds, and bats are great enemies of the perfect insect, and Syrphid larvae have been seen to destroy Chrysopa larvae. Hemiteles Astrolis, Gr., Helorus anomalipes Pz., and Microgaster perhae, are all varasites of Chrysopa larvae, and Telenomous aerobates, Giard, parasusses their eggs. A bibliography of 18 works completes the paper.

Cacoecia costana.—Bull. Soc. d'Etude et de Valgarisation Zool. Agric., Bordeaux. xii, no. 5, Oct. 1913, pp. 156-157.

In an editorial note mention is made of the occasional ravages of Tortrix (Cucoccia) costana in vineyards. Henri Kehrig (Femille vinicole de la Gironde, 22nd May 1890, and Bull. Soc. de Zoologie Agric., 1911), Dr. Schwangart (Mitt. d. deutschen Weinbau-Verein, June 1911), and F. Picard (Progres Agricole, 5th May 1912), have reported this pest in the Gironde, the Palatinate, and in Camargue.

Quarantine Regulations on Shipment into Georgia of Articles from Territory Infested with Mexican Cotton Boll Weevil.—Georgia State Bd. Entom., Atlanta, Circ. no. 13, Oct. 1913.

At a recent meeting of the State Board of Entomology, the following regulations were adopted concerning shipments from sections of the country infested with Mexican cotton boll weevil. Restrictions were placed on the following articles when originating in infested areas:—(1) Seed cotton; (2) cotton seed; (3) seed cotton sacks. cotton seed sacks, cotton pickers' sacks which have been used within 25th months; (4) cotton seed hulls, between 1st Aug, and 30th Dec.;

(5) Spanish moss and corn in shuck, or shucks removed from corn, between 1st Oct. and 30th June; (6) household goods containing any of the foregoing articles, during the period of quarantine applying to each; (7) living weevils in the possession of any person outside of their infested territory, except a qualified entomologist. Under certain conditions restricted articles can be shipped from uninfested section of States in which boll weevil occurs.

No restrictions were placed on the following articles: -(1) Bales of cotton, flat or compressed, with no restrictions as to season; (2) linters and loose cotton lint; (3) cotton seed meal, cake and oil; (4) corn, shelled or shucked, or with shucks removed, oats or any other seed except cotton seed; (5) cotton seed shown by affidavit to have been eached continuously for nine months or more; (6) cotton seed for planting purposes only, after fumigating with carbon bisulphide by competent entomologist; (7) hay; (8) empty freight cars.

VAYSSIÈRE (P.). Cochenilles nouvelles de l'Afrique française [New Coccids from French Africa.]—Rev. Phytopath. appliquée, Paris. i, no. 9, 5th Oct. 1913, p. 124.

A short description is given of Mytilaspis coccomytibus dispar, ssp. nov. and Diaspis taxicola, sp. nov. The former was found in large numbers on a branch of manioc in Madagascar, while the latter was collected on Taxus baccata in the Atlas of Blidah (Algeria).

CHITTENDEN (F. H.). The Florida Fern Caterpillar. U.S. Dept. Agric. Bur. Entom. Washington, Bull. 125, 29th Oct. 1913, 11 pp., 1 fig.

The fern caterpillar, Eriopus floridensis, is a native of Florida and tropical America, but is extending north, causing damage in greenhouses in Columbia, Illinois, and Ohio. It has also been reported in Mexico, Guatemala, Costa Rica, the Bahamas, Jamaica, Cuba. Haiti, St. Lucia, St. Vincent, Venezuela, British Guiana, Brazil, and Trinidad. It is restricted to ferns, and appears to destroy more than it requires for food, cutting plants entirely bare and attacking each new leaf as it appears. Though not strictly a nocturnal feeder, it shuns bright light, and is most often found feeding exposed in early morning. Treatment of this pest is not easy. In one case a spray of a strong decoction of hellebore was used; this scalded the foliage. causing many plants to die. A bait of poisoned bran and molasses was tried, but the caterpillars preferred the ferns. Fumigation with carbon bisulphide was of no avail. Lead arsenate when used in a solution strong enough to kill the caterpillars is said to leave a white deposit, which destroys the commercial value of the fern. A spray of Paris green, strong enough to kill the caterpillars, burns the foliage Paris green properly mixed with Bordeaux mixture should not produce this effect. Hydrocyanic-acid gas fumigation is also suggested for use when the eggs are hatching and during moults. It seems that handpicking, though laborious, is most successful, one of the best methods consisting in shaking the plants over the ground and trampling on the caterpillars as they fall. Ichneumon extrematis, Cress., Sagaritis spand a Tachinid fly have been observed attacking this caterpillar.

PARKER (W.). A sealed Paper Carton to protect Cereals from insect attack.—U.S. Dept. Agric., Washington, Bull. 15, 16th Oct. 1913, 8 pp. 8 figs.

The injury done by insects to packed cereals causes a financial loss much greater than most millers suppose. Examination of infested backages showed that infestation usually commenced where there was a hole in the package; carefully sealed packages appeared intact. The more important insects attacking stored cereal products are the Indian-meal moth (Plodia interpunctella, Hübn), the Mediterranean four moth (Ephestia kuchniella, Zell.), the meal snout-moth (Pyralis farinalis, L.), the saw-toothed grain beetle (Silvanus surinamensis, L.), the confused flour beetle (Tribolium confusum, Duy.), the granary weevil (Calandra granaria, L.), and the rice weevil (C. oryzae, L.). The cereal is sterilised prior to being packed, and when insects are found in packages, the eggs, larvae, or adults have gained access to the cereal after, or shortly before, the cereal was packed. In an experiment to test the efficiency of a cheap scaled carton, a cereal was sterilised and placed in sterilised packages. Had any insects or eggs been in the packet, the temperature of 180° F, used for sterilisation of the cereal would, undoubtedly, have killed them. The packages were closed by glueing the ends, but some were covered with label paper, so that there were no openings. Some labelled and some unlabelled packages were placed in boxes with flour badly infested by the confused flour beetle. Tables of the results of the experiment show the label to be efficient in preventing insects entering the cartons. Infestation may take place in the cereal elevator leading from the steriliser to the packing room or in the grocer's storeroom. In drying non-flaky cereals a sterile chute with baffles, through which hot dry air is blown, would be effective. In the case of flaky cereals, a belt-elevator is necessary, but this can be inclosed and the hot air used as before. Both elevators should be so constructed, that they can be readily sterilised with air at a temperature above 180° F. The sealed carton may be made of a stiff cardboard. The printed label should be of three pieces, two ends which lap over the edges and extend down the side, and a side piece. Care must be taken to seal the ends of the carton properly before applying the label. Another package has been suggested, namely, the placing of a scaled typer hag inside an ordinary carton. This has proved to be no better than the old-style packages. In a large flour mill in California, 160 lb. steam is used as a source of heat, and a carrier eight feet long, with its load of cereal, can be heated to 180° F. in two minutes, by this means, without difficulty.

CHIFTENDEN (F. H.). The Rose Slug-Caterpillar. —U.S. Dept. Agric., Bur. Entom., Washington, Bull. 124, 31st Oct. 1913, 9 pp. 1 fig.

It is only within comparatively recent years that the slug-like caterpillar. Euclea indetermina, Boisd., has been known to injure the tose, though the larvae appear to have been known since 1797. Synonyms of E. indetermina are Callochroa viridis, Reak., C. remata, Pack., and Parsa chloris, Grote. It is not a common species, and as it is of interest to rose-growers and to nurserymen, the author gives illustrations and a brief description of it. The larva has been observed

on Rosa spp., Pranus spp., Quercus spp., Castanea dentata, Carya spp., Asimina triloba, Myrica cerifera, Cornus florida, plum, apple and pear. It feeds on the edges of the leaves. The eggs, which are deposited on the underside of the leaf, hatch after about nine days. The larvae mature about the middle of September, passing through eight or nine stages, and have stinging spines. If only a few rose-bushes or young trees are attacked, handpicking will control this insect, precaution being taken to use a glove. A spray of Paris green or arsenate of lead may be applied.

[ICARD (V. A.). Rapport de l'entomologiste du Ministère de l'Agriculture de la Province de Quebec pour l'année 1912-13. [Report of the Entomologist of the Ministry of Agriculture of the Province of Quebec for the year 1912-1913.] —Quebec, 24th Oct. 1913. [15 pp., 5 figs.

The tent-caterpillars were the most important pests of the year. Malwosomatamericana, F., chiefly attacks orchards and M. disstria. Hb., forests. The larvae of both soon strip a tree of its leaves. While it is evidently impracticable to prevent this destruction in the case of forest trees, damage in orchards can be almost entirely prevented. The eggs are easily seen on the bare branches in winter, and nearly all may be collected and burnt. Speaking generally, all insectivorous birds should be protected. The services of a sparrow are valued at 12 shillings a year in France, and must be worth more in the Province of Quebec. Banding is useful. Where the caterpillars emerge in the tent they may be taken and burnt, or a petrol torch may be used. Spraying the infested parts will destroy those caterpillars which have just hatched out. The spray is made up of 1 lb. Paris green in 160 gals, water, or 2 lb, arsenate of lead in 40 gals, of water.

In 1913 the San José Scale was observed for the first time in the Province on a young service tree, which was destroyed without delay. The woolly aphis Eriosoma (Schizoneara) lanigeron was observed in three places, but only a few trees were infested and instructions were given for the affected branches to be burnt. In a garden at Montcalmville, near Quebec, the Oyster-Shell Bark-Louse (Mytilaspis pomorum) was observed. The New York Plum Scale (Lecanium prunastri) was reported to be present in orchards of the county of Islet. In conclusion, the author suggests provincial legislation on three points: (1) To require an annual inspection by the Entomological Bureau of the Ministry of Agriculture of all those nurseries in the Province which deal in plants and fruits; (2) to give the inspector power to destroy plants infested by dangerous diseases or to order suitable treatment; (3) to forbid nurserymen to distribute their products unless they hold the current year's certificate from the Entomologist certifying that their nurseries are free from parasitic disease or insect pests.

Kine (H. H.). On the use of Poison in the Control of Locusts in the Anglo-Egyptian Sudan, —Cairo Scientific Jl., Alexandria, vii, no. 86, Nov. 1913, pp. 251-254.

The species of migratory locust most common in the Anglo-Egyptian Sudan is Actidium (Schistocerea) peregrinum, Oliv. The young locusts

appear after rain, and feed during the morning and evening. The perhods of controlling locusts which have been adopted in the Sudan reduce the following: (1) Collection and destruction of eggs and hospers: these methods need a large amount of labour and the electing of eggs may be exceedingly arduous; (2) scaring away of addits by noises; (3) the use of bacteria, as Coccobacillus accidiorum, affattle help in the control of locusts.

tuning 1907, the author tested various other methods, among them possible but. This bait consisted of fresh, green grass, finely chopped and soaked in a solution of 1 lb, arsenite of soda and 4-11 lb, treacle in 12 gallons water. This bait was scattered thinly either in front of the sam while it was moving and feeding or under the shrubs in which the hoppers were roosting. The bait was readily devoured when the treacle was present in the proportion of 4 lb, to 12 gallons of water, but the hoppers were attracted still more when the proportion of the treacle was increased. A swarm fed with poisoned bait at about 7 a.m. would all be dead the following morning. Animals were not allowed to make over the area treated for six days. The use of arsenite of soda in the control of locusts saves an enormous amount of labour, and the eatire swarm is destroyed. The risk to cattle and other grazing animals, with ordinary precautions, is infinitesimal.

Kershaw (J. C.). Recommendations for dealing with the Froghopper. Dept. Agric. Trinidad and Tabago, Special Circ. no. 9, 1st Dec. 1913, 10 pp.

Under artificial conditions the vermilion egg-parasite, Oligosita gondii, Cwf., parasitised 5 to 6 per cent. of froghopper eggs. After careful examination the author concludes that in nature the percentage is between 5 and 10 per cent. in the most favourable localities, with an average below 5 per cent. This parasite is, therefore, not worth consideration, and former recommendations for dealing with trash with regard to it are cancelled.

The Syrphid fly [Salpingogaster nigra, Schiner] is the chief check on the multiplication of the froghopper in Trinidad. Unfortunately, it usually appears in numbers only on the later broods. Its larvae are very voracious, and in most localities nymphs are scarce after the wet season, and the Syrphid larvae will probably either starve or destroy one another. Many female froghopper adults escape all enemies, and produce the early broods in the ensuing season, when there are but few Symphids about. The author thinks it would be well worth trying to ideal the Syrphid on through the dry season, in order to have a apply ready to distribute on any well-marked early broods of froghoppers. About 300 nymphs per day are required to feed 100 Syrphid larvae, but nymphs of Tomaspis pubescens can be procured in the dry season, and a supply of the Syrphid could be kept up in a large cage or enclosure, preferably erected over a channel or drain with suitable class already growing there. A light rough construction would serve the purpose. The Syrphid will copulate and breed in a large and mitable cage. Then a few adult Syrphids and a few maggots could be histated on early froghopper broods, wherever they occurred in "Junhers.

The author is not in favour of destroying the nymphs by ramming huc highly approves of early broods being collected by hand. The nut many approves of early broads in young cane by squeezing the len crushing in autous of carry sheaths where they congregate is also recommended. Possibly the plan would be even more effective than using the kerosene-lised emulsion, but every efficient method should be used against the early broods, because it is impossible to do much against the enormous later ones. All abandoned land and grass fields near cane should be grazed or put under cover crops. The cattle disturb the froghopper so much. that it avoids these fields. Cutting the grass is useless. Regarding cane-trash, the author now thinks it probable that (where trash cannot be removed to the cattle pens) the best plan would be to keep it in a few large piles (boucans), rather than long beds between the rows of cane, provided that these boucans could be turned right over, and the nymphs below destroyed. As regards the destruction of adult froghoppers, trap lights are about the only method at present of any value at all, when the insects appear in great swarms. The following catches were made on badly "blighted" fields during September 1913; Night of 5th September, 24 lamps, 56,900 froghoppers; 10th September, 12 lamps, 23,420; 21st September, 72 lamps, 58,363. These were only the largest of many catches at lights. The hurricane lamps were placed about 20 to 25 feet apart, i.e., one opposite the end of each cane bed along the trace, and stood in trays about 2 feet square, with a ledge to retain the water and film of kerosene, or a mess of molasses. They should also be placed where there is any open space among the

Summarised briefly, the author's recommendations are: (1) That a search be made for an efficient egg- or adult-parasite of the froghopper, though it is very unlikely that any will be procured in islands near Trinidad, or any adjacent part of the mainland; (2) that meanwhile every effort should be made to get the Syrphid on the early broods of froghopper; (3) abandoned lands adjacent to cane-fields to be either put under a cover crop or grazed; grass "traces" to be hoed and the rubbish taken to the cattle pens, especially just before the wet season; (4) all trash should be removed to the pens, and not returned to the fields till well broken up and sodden, and especially the trash of the two or three rows of cane nearest to traces or grass land just before the wet season; (5) after the appearance of early broods of froghopper nymphs they should be destroyed by kerosene-lysol emulsion or by squeezing the leaf-sheaths, whichever proves the quicket and more effective; (6) the later large swarms of adults should be destroyed as far as possible by trap-lights.

A grasshopper (Xiphidium sp.) is very common in grass lands, and destroys froghoppers along with other insects. It is considered to be X. raripenne. Next to the Syrphid, however, the author holds spider to be the most effective natural enemies of the froghopper.

Guppy (P. L.). Life-history of the Syrphid fly predaceous on Froghopper Nymphs.—Bull. Dept. Agric., Trinidad and Tobago, xii. no. 75, Nov. 1913, pp. 159-161.

From 30 to 40 nymphs are killed and sucked during the life of a larva of this fly [Salpingogaster nigra, Schiner], which is from nine to

In days' duration, and no doubt it destroys numbers of very small symphs wherever these are abundant. In two instances adult freghoppers were found killed by the maggot, which had attacked them when they had just issued from the last nymphal instar and were too soft to escape from surrounding froth. Besides the nymphs of foodspits succharina (the sugar-cane froghopper) it kills those of foodspits succharina (the sugar-cane froghopper) it kills those of foodspits apidly, and is able to follow the nymphs under the soil. The dy itself resembles very closely a small black wasp with some yellow markings on the thorax and abdomen. Even when the fly is settled, at continues to move its abdomen in and out, just as a wasp does. This dy is one of the most important enemies of the froghopper. It is hoped to breed it successfully on a large scale so as to get it started earlier in the season.

CIMATTI (V.). Per la difesa dei nostri agrumi. [The protection of our citrus fruits.]—Rivista di Agricoltura, Parma, xix, no. 49, 5th Dec. 1913, pp. 782-784.

In 1910, Italy sustained a loss of about £40,000,000 through insect pests. A most dangerous one, which threatens to spread among the citrus plants, is *Chrysomphalus dictyospermi* var. *pinnulifera* (biancarossa). Lime-sulphur is useful for its control, and some of the conclusions arrived at by Martelli after long and repeated experiments with this insecticide are: The purity of the lime is of prime importance. The lime must contain 90 per cent. of calcium oxide, and in the 10 per cent. of inpurity the magnesium oxide must not exceed 5 per cent. The sulphur must be of a very high degree of purity (98 per cent.), and in almost impalpable powder.

The larvae of Prays citri, Mil. (tignuola, zagara) ruins the orange blossoms. The following spray formula is given: 20 gals, water, 22 lb, molasses, 22 lb, dregs of lime juice essence, and 2 gals, water in which 43 lb, of sodium arsenite have been dissolved. Spray in May, repeat 10 days later; then apply again in June and repeat as before. Another pest of citrus plants, Pseudococcus citri, Risso, causes the white mould thuffa bianca or cutumeddu), which is nearly always accompanied by fumaggine. The following emulsion is suggested: 6 lb, soap (soft or hard), 13 pts. petroleum, 20 gals, water. It should be applied, as usual, in lune.

CHITTENDEN (F. J.). On Beans damaged by Beetles, --Jl. R. Hort. Soc., London, xxxix, pt. 2, Dec. 1913, pp. 379-380.

In some seasons a considerable proportion of the seed of broad-heans offered for sale is found to be damaged by a boring beetle, Bruchus rafimanus, Boh., often wrongly called the bean weevil. The question arises whether the damaged seeds may be sown with a prospect of reaping a crop. As it would be manifestly mwise to sow the beetles as well as the seeds, it is recommended first of all to destroy the beetles in the seed by fumigating with carbon bisulphide (3 lb. to 1,000 cubic feet of space) for 48 hours. Experiments have shown that seeds thus treated have produced plants as strong and as healthy as those from

undamaged seeds. The beetle instinctively avoids the radicle and plumule when boring, confining its attention to the food-stuff stored in the cutyledon, and of this there is a store great enough to satisfy the plant after the ravages made by the beetle. The only danger is that if the weather be cold and the seed long in germinating, there is a possibility of decay setting in, for bacteria or fungi would have easy access through the wounded testa.

WCNN (H.). Im Unterelsass und in der angrenzenden Rheinpfalz festgestellte Cocciden. [Coccids recorded from Lower Alsace and the adjoining Rhine Palatinate.] Zeit. wissen. Insektenbiol., Berlin. ix, nos. 8-9. 1st Sept. 1913, pp. 255-258.

This is a list of all the species of COCCIDAE, known from the area indicated, and with each species is given a very full record of the localities in which it has been found, and all the plants on which it has occurred. The list is being published in instalments.

The Fertilisation of Cacao. Gardens Bulletin, Straits Settlement, Singapore, i, no. 6, 15th Dec. 1913, p. 195.

The number of cacao pods formed on a tree is very much out of proportion to the number of flowers produced. Mr. G. A. Jones, who has experimented to find the reason of this, has noticed that if the common red ants which tend green fly about the flowers are kept away, no pollination results. There is, however, no positive evidence to show that red ants have anything to do with the fertility of the flowers.

BURKILL (I. H.). Clerome gracilis, a Butterfly destructive to Palms.— Clardens Bulletin, Straits Settlements, Singapore, i, no. 6, 15th Dec. 1913, pp. 188-186.

The caterpillar of Clerome gracilis, Butl. (AMATHUSHNAE) is social in its habits, and has been found to damage Rhopaloblaste palms. The caterpillars, when both feeding and resting, are found on the under surface of the leaf, feeding only at night.

Burkill (I. H.). The Coconut Beetles, Orycles rhinoceros and Rhynchophorus ferrugineus,—Gardens Bulletin, Straits Settlements. Singapore, i, no. 6, 15th Dec. 1913, pp. 176-188.

The two beetles legislated against in the Straits Settlements are Oryctes rhinoceros and Rhynchophorus ferrugineus. The first is the commoner, but individually less destructive: it feeds as an adult in the stems of living palms, generally coconut palms, tunnelling into the softer parts of the stem: it may lay its eggs in these tunnels, but usually it does so in decaying vegetable matter, sawdust, etc., and especially in the central parts of dead palm trunks. The Palm Weevil (R. ferrugineus) lays its eggs on the coconut trees, making a small hole for each egg with its long snout. The burrows of the Rhinoceros Beetle (O. rhinoceros) give the Palm Weevil access to the inside of the palm, of which full advantage is usually taken. The eggs give rise to

alate grubs, which eat out galleries through the softest tissue, thereby

bestroving the heart of the palm cabbage.

The Rhinoceros Beetle is common from India to the Philippine Islands, wherever large palms abound. In Africa its place is taken by the composeros and O. bous, which attack palms in the same way. In Madagascar are six other species of palm-attacking Oryctes. In the Yand of Rennion there are two species. Tropical America has a Madar habits. Allied genera, Pimelopus and Scapanes in New Guinea, and Camelonotus in America, attack young palms, burrowing into their stems from the ground. The Palm Weevil of Asia, occurs in India, Ceylon, and eastward to the Philippine Islands. It is replaced by R. phoenicis in tropical Africa, and by the allied R. palmarian and R. craendalus in tropical America.

As to the extent of the damage done by the Rhinoceros Beetle in Sansoa, about the beginning of 1912, an official statement was made that Fortrees had been destroyed and 6,000 to 8,000, or one-fifth of the others maffected areas, had received damage enough to postpone their yielding for one or two years. Measures taken to cope with the beetle conseted of collecting the grubs, and trapping the beetle in holes dug in the ground and filled with material such as rotting stumps, which afford suitable breeding places for the insect; the traps were visited periodically and the beetles killed by sufficiation with carbon bisulphide. These methods were, however, expensive. The method adopted now against both the Rhinoceros Beetle and the Palm Weevil consists in removing every kind of material from the plantation which would offer a suitable breeding place for the beetles - not only palm -tumps, but also all sorts of decaying vegetation, etc. For the removal of dead trees and stumps the author advocates the use of explosives. Experiments made to find the quantity of explosive secessary to destroy trees and stumps showed that to blow a stump completely to pieces, four cartridges of blasting gelatine, placed in a hole drilled in the base of the stump, were sufficient; four cartridges of blasting gelatine similarly placed in the base of a standing dead tree and exploded, brought it down, leaving in the ground insufficient material to serve as a breeding place for the beetle; four cartridges of gelignite did not suffice to do the work thoroughly, nor were three cartridges of blasting gelatine quite sufficient.

The following palms are recorded as attacked by the Rhinoceros Beetle: Cocos nucifera (Coconut), C. phomosa, Martinezia caryotaefolia, Phomix dactylifera (date palm), P. sylvestris, Livistona chinensis, Verschuffeltia splendida, Dictyosperma album, Hyophorbe amaricaulus, Elmis guineensis (African oil palm), Corypha umbraculifera (Talipot palm), C. gebanga, and Borassus flabelliformis. The following are recorded as attacked by the Palm Weevil: Oreodoxa regia (Royal palm) Borassus flabelliformis, Phoenix sylvestris, and the author has found it on Arenga swecharifera and Elaeis guineensis.

The following papers containing detailed accounts of the life-history, haints and methods of combating these beetles are referred to include the containing the same and methods of combating these beetles are referred to include the containing the same and the same and the same and the same and the same are same as the same and the same are same as the same are same are same as the same are same as the same are same are same as the same are same are same as the same are same are same are same as the same are same are

Bull. No. 4, Dept. Agric., Burma (1910), p. 3; Ridley, Rept. on the Destruction of Cocoanut Palms by Beetles, Journ. Asiatic Soc., Straits Branch, No. 20 (1889); Beven, Trop. Agric., N.S., xxiv, May 1905, p. 111; Koningsberger, J. C., Mededeelinger van Slands Plantentuin, xxii (1898), p. 42; Summers, Canadian Entomologist, v, p. 123; Blanford, Kew Bull., 1893, p. 37; Ghosh, C. C., Mem. Dept. Agric. India, Calcutta, ii, No. 10, Dec. 1911.

KEMNER (A.). Vara Clerider, deras levnadssätt och larver. [Our Cleridae, their habits and larvae.]—Ent. Tidskrift, Uppsala. xxxiv, 4th Dec. 1913, pp. 191-210, 12 figs.

The author gives an account of the following Clerid beetles from Sweden: Thamasimus formicarius, L., Corynetes coerdeus, De Geer, Opilo mollis, L., O. domesticus, Sturm, Tillus elongatus, L., and Necrobia violucea, L. The larvae of these species are described and a key to them is given with figures of the posterior extremities.

The following additions are made to our knowledge of their biology. The larva of Thanasimus formicarius is abundant in the galleries of Myelophilus piniperda, L., and Ips typographus, L. Young larvaeoccur in June and pupation takes place in August September, but many hibernate. The Clerid larvae prey on those of the Scolytid beetles. The larva of Opilo domesticus was found in wood in the Royal castle of Kalmar in the galleries of Anobium striatum on the larvae of which it preys. The small heaps of frass observed on the surface of timber and furniture attacked by Anobium are, as a matter of fact, not made by Anobium, but by the larvae of Opilo; as this larva itself is able to make galleries in the timber it cannot be regarded as wholly beneficial; it is, however, very predaceous, as the great number of empty skins of Anobium larvae to be found in the galleries bear witness.

The larva of Cocyneles coerulens, a species which Thomson believed to have been imported at Gottenborg, but which now is not uncommon in the southern and central parts of Sweden, was also found on the same occasion preying on the larvae of Anobium. As this larva is of smaller size than that of Opilo domesticus, it can hunt the larvae of Anobium without making any galleries itself, and is therefore presunably more beneficial than the former, but on account of its comparative scarcity its controlling influence is not important in Sweden.

Necrobia violacea hibernates as an imago, and its larva is found on carcases, feeding on other larvae.

SAHLBERG (J.). Till kännedomen om Haltica engströmi och dess biologi. [A contribution to our knowledge of Haltica engstrocmi and its biology.] - Ent. Tidskrift. Uppsala, xxxiv, 4th Dec. 1913. pp. 261-270, 1 pl.

This beetle was described by Sahlberg as far back as 1893, but only provisionally, as only females were found. Subsequently, it was discovered in two different localities in N. Russia, and during recent years again in Finland, the last time near Gammelstad on Spinne ulmaria, leaves of which were riddled with holes, sometimes only the

ameipal veins being left. From the last-named locality it has spread in the reach year.

saliberg concludes that the species is an immigrant from the east, and that it will continue to spread westwards, and eventually reach swiden. He succeeded in finding the larva, which, in July, lives in the same manner as the adult does in spring and autumn. A detailed dagnosis and figures of the larva, male, female, and an attacked leaf are given.

Gas Tar and Mealy Bug. Gardener's Chronicle, London, liv, nos. 1399, 1401, 1407, 1409, 18th Oct., 1st Nov., 6th Dec., 13th Dec. 1913, pp. 279, 309, 407, 427.

Readers of the "Gardener's Chronicle" have communicated the results of their experiences with gas tar as a means of combating the mealy bug (Pseudococcus citri) on vines. Mr. A. Shakelton, Chard, says that he found a mixture of 6 to 9 parts of clay and one part of gas tar to do as much injury to the vines as to the pest: he obtained good results by the use of Gishurst compound. Mr. J. Whytock upholds the use of a mixture of clay and tar, finding that it destroys the pest without injuring the vines; the varieties of vine grown by him were Mrs. Pince, Lady Hutt, Gus. Colman, and Appley Towers. Mr. Singleton thyfordshire, says that the use of a mixture of gas tar and clay in the above proportions caused complete failure of the crop of Black Hamburgh grapes, but he used it successfully in the case of varieties such as Lady Downes and Black Alicante. "J. H. Y." gave up the use of all such methods as painting with tar in favour of fumigation with hydrocyanic acid, which, according to him, is entirely satisfactory, completely killing the pest without injury to the vine or any other plant in the house (except Tradescantia). He also found the gas equally successful in killing brown scale (Lecanium persicae, Geoff.) on peach trees.

GLASER (R. W.) and CHAPMAN (J. W.). The Wilt Disease of Gipsy Moth Caterpillars.—Jl. Econ. Entom., Concord, vi, no. 6, Dec. 1913, pp. 479-488.

In August 1912, the authors published a paper in Science entitled: Studies on the Wilt Disease or Flacheric of the Gipsy Moth." [See also this Review, Ser. A. i, pp. 33–36.] More extensive observations and experiments conducted during the past year have led them to modify some of their original views concerning this disease. The conclusions drawn from the first series of observations concerning the mode of infection and general pathology were, on the whole, correct, but the etiological connection of a micrococcus with the disease was not so well grounded. The micrococcus described in 1912, and believed to be connected with the wilt disease, has proved to be a casual intestinal parasite. The reason for eliminating this organism (Giacoccus flaccidifex) from the possible excitors of the disease are the following: If smears were made from caterpillars dead but a short time, no bacteria could be found. Cultures made from such cater

pillars on caterpillar and other nutrient media remained sterile. If serial sections are made of diseased caterpillars obtained in the field polyhedral bodies will be found in abundance, but no bacteria in the tissues, and usually the intestinal lumen will be free from microorganisms in general.

Great care was taken to procure healthy uninfected caterpillars for the experiments, by collecting from localities where no epidemic was evident. The caterpillars were divided into groups, and each group was subjected to slightly different conditions of temperature, light moisture, etc. This gave the disease, if latent, every chance of becoming manifest, since conditions unfavourable to the caterpillars are believed to assist its development. If the disease under one or other of the conditions broke out, the whole of the caterpillars collected from the same locality were discarded. Such a method of obtaining healthy individuals is much more satisfactory than the blood test, as the controls showed.

Many views have been held regarding the agents responsible for the disease. Escherich and Miyajima in 1911 were of the opinion that the polyhedral bodies were the carriers of the virus; Bolle believed that a Microsporidian (Microsporidiam bombycis) was responsible. According to Knoch, little refractive granules appear in the blood corpuscules; these multiply and infect the nuclei of tissue cells, where their amoeboid membrane hardens and they change into polyhedral bodies; he further states that the minute granules, which resemble the Chlamydozoa of Prowazek, are the vegetative, the polyhedral bodies the resting stages of the causative organism. Prowazek was able to infect caterpillars with the disease by means of a filtrate of emulsified diseased material, which contained neither bacteria nor polyhedral bodies; his experiments, in the author's opinion, are suggestive, but not conclusive, as no controls were made, and the blood test was the only one used in diagnosing the health of the caterpillars.

Thirty filterable viruses are known to be responsible for diseases in man and the lower mammals, but only one has been described in insects. viz., that of sacbrood, a bee disease discovered by White in 1913. [See this *Review*, Ser. A, i, p. 186.]

Coming to the experiments made by the authors, it is first stated that the reason why filtrates of diseased material gave negative results in 1912, was that the emulsion was too concentrated. This year, caterpillars which died of the disease were crushed with just enough sterile water to facilitate the crushing. This material was then strained through cheese-cloth and filtered by means of suction through filter paper; the filtrate was diluted in one case with fifty, in another with twenty-five times its volume of water. This was then passed through a Berkefeld "Grade N" filter and used for the infection experiments. The filtrate was free from bacteria and polyhedral bodies. Nothing could be observed except some very minute dancing granules, also noticed by Prowazek in his experiments with silkworms. A large number of caterpillars were fed with the Berkefeld filtrate. smeared on red oak leaves. In one series of experiments 50 caterpillars were fed with the filtrate, in another 40, in a third 20. The same number was fed with material before it was passed through the Berkefeld filter, and a large set of controls, fed with Berkefeld filtrate which had been sterilised by autoclaving, accompanied each series.

Out of the entire lot of caterpillars (110) fed with unsterilised Berkefeld filtrate, 28 died with typical wilt symptoms. Polyhedral hodies acre abundant, but there were no bacteria. Other caterpillars died from other causes: the caterpillars dying thus differed from those dying of wilt disease in being tough instead of flaccid, and in the absence in mem of polyhedral bodies. Some of the caterpillars were killed by the fachinid parasite. Compsilura concinnata. A greater number of caterpillars (48 out of 85) died in the experiments with the unfiltered virus. This seems to show that the virus is filterable, but with difficulty. Among the entire number of controls, 162 caterpillars, only three died of wilt, equivalent to about 178 per cent., a very small percentage, which can be overlooked as an experimental error.

The polyhedral bodies have as yet revealed nothing of a parasitic nature; they may be a resting stage of a filterable vegetative form, but the authors are rather inclined to regard them as reaction bodies. They are possibly products of nuclear digestion, produced by the virus invading the nuclei and digesting the chromatin.

One more matter is considered, viz., the question as to whether the disease is carried by the air, as is held to be the case by W. Reiff. Details are given of the experiments carried out to test this view, and the conclusion is that the wind is not an important factor in transporting the disease, and that infection in nature occurs when caterpillars feed on leaves soiled by the juices of dead individuals.

A striking phenomenon observed in all the experiments was the large number of moths obtained from caterpillars which had been repeatedly infected. This seems to suggest a degree of immunity possessed by some of the caterpillars, and agrees with the observations in the field, where, in a given locality, the disease raged for several weeks, and yet moths were seen later in abundance.

Goven (L. H.). The Fumigation Campaign of 1912-1913.—Agric. * Jl. of Egypt, Cairo, iii, part 1, 1913, pp. 38-41.

The fumigation with hydrocyanic acid gas in Egypt of citrus trees affected with scale-insects was commenced by the Department of Agriculture in January 1912. Two gardens containing about 3,000 small trees were fumigated with satisfactory results. For the fumigation campaign of 1913-1914, the equipment consisted of seventytwo fumigation sheets, of which thirty were 20 feet in diameter, thirty 34 feet in diameter, and twelve 45 feet in diameter. These, except five of the largest, had been made at Cawnpore to the pattern given in Mr. Woglum's paper (Fumigation of Citrus trees, U.S. Bureau of Entomology, Bull. 90). The cloth used was 71 oz. drill; the dosage was calculated from the tables given in that paper, one ounce charges being given in every case to allow for the loose texture of the cloth. A start was made in October 1912, in the garden of H.H. the Khedive, at Kubba, the fumigation campaign being carried out by the staff, consisting of a European Inspector, and at first seven, but generally two, students. The tallest trees fumigated were 23 feet high, those taller being usually too old to be profitable. The balance sheet showed 4 small loss.

The scale-insect (Aspidiotas aonidum, L.), which does the damagin Egypt, is a recent introduction, and the depreciation it causes may be 50 or 60 per cent. The improvement due to fumigation pays for itself in the first season and leaves an additional profit over and abovlast year's takings.

WILLIAMS (C. B.). On two new species of Thysanoptera from the West Indies. Jl. Econ. Biol., London, viii, no. 4, 16th Dec. 1913, pp. 209-215, 2 figs.

Two collections of Thrips were received by the author from Mr. F. Birkinshaw, of the Agricultural Experiment Station. Kingstown. St. Vincent. The insects had been taken in the grounds of that station on cacao and bitter cassava (Manihot utilissima). It was stated that the manihot leaves were injured somewhat and consequently did not develop properly; the insects however, did not appear to be a source of great injury so far as the yield is concerned, unless it was present in large numbers. The collection of insects taken on cacao consisted entirely of larvae and adults of Heliothrips rubrocined, Giard; that from cassava contained two species, both of which appear to be new. One belongs to the genus Frankliniella, and has been called F. melanommatus; for the other it has been found necessary to creet a new genus of the family Thripidae, and the name Corgnothrips stemopterus is proposed for it.

Thomeson (W. R.). La Spécificité des Parasites entomophages. [Specialisation of habit in Parasites of Insects.]—C. R. de la Soc. Biol., lxxv, no. 36, 19th Dec. 1913, pp. 559-560.

In a second communication upon this subject [see this Review. Ser. A, ii, p. 16], the author describes experiments he made with the Tachinid parasite Sturmia scatellata, R.D., supplied with eggs of Lymantria dispar, Clisiocampa disstria, C. americana, Vanessa antiopa. Hemerocampa leucostigma, and Orgyia antiqua. In the first three the parasites developed normally; they did not develop at all in Vanessa. In the last two, although the eggs were given in large numbers, not a single perfect larva was obtained; upon dissection 44 larvae of the parasite were found, but of these only one had grown, and instead of being as usual in the muscles of the host larva, they were free in the general body cavity, and were much smaller than is usual with larvae at that age. Besides these, 42 larvae were found dead and decomposing and surrounded by phagocytes.

It is evident that Sturmia scutellata cannot live and develop in surroundings other than those furnished by such hosts as L. dispar of C. disstria and americana. L. dispar belongs to the Lymanthidae, whereas C. disstria and C. americana belong to the Lasiocampidae; there is not, therefore, necessarily any relation between the taxonomic position of Lepidoptera and their special parasites. On the other hand different parasites can often live in a limited number of hosts under the action of certain ethological factors that are at present difficult to determine.

Gowder (C. C.). A List of Uganda Coccidae and their Food-plants.— Ball. Entom. Research, London, iv, pt. 3, Nov. 1913, pp. 247-249.

The first which the author gives of the COCCIDAE of Uganda is the result of an extended search among the flora of that country. Owing to the favourable climatic conditions and the luxuriance of vegetation, Coccids continue to grow and multiply throughout the year. The family is abundantly represented, no less than 49 species being a uncertated.

DUDGEON (G. C.). A Proposed Method of Controlling the Ravages of Leaf-eating Caterpillars.—Bull. Entom. Research, London, iv, pt. 3, Nov. 1913, pp. 243-245.

In Egypt, where temperature and humidity exhibit practically no variation which can seriously affect agriculture, and where the land is arrigated by a well organised system of canals, which serve also to fertilise the soil, almost the only uncertain factor which may affect results is the presence or absence of insect pests. The isolated position of Egypt with respect to other countries makes it less liable to the introduction of pests, but on the other hand, when a pest has gained a foothold, it remains unattacked by natural enemies, which in less isolated countries would tend to exterminate it. The present paper deals with the so-called "cotton worm," the caterpillar of Prodenia litura, F., a Noctuid moth of the sub-family ACRONYCTINAE. Previous to 1910, the Government had legislated against this pest, but the methods employed were purely mechanical, consisting of destroying the egg-masses as soon as they appeared; other methods employed were equally costly and less efficacious. In 1910, upon the formation of the Agricultural Department of Egypt, attention was turned to the possibility of introducing disease among the larvae. Experiments were made in which bodies carrying diseases known to attack lepidopterous insects were introduced and the larvae of P. litura were infected with them. Muscardine and other fungoid diseases were found unsuitable, owing to the dryness of the climate. Pebrine and flacherie were tried, but it was impossible to say what the results were, as a superinfection occurred due to a protozoan disease known as "grasserie" (Microsporidium pulp dricam. Bolle). This disease was so efficacious that all the larvae of Prodenia in the experimental area were killed. A month later it was found difficult to procure Prodenia uninfected by the disease from any part of the country. The author believes that the outbreak was spontaneous, and that it had nothing to do with the laboratory experiments. Steps were taken to secure the continuity of the disease. In experiments to find out how this might best be accomplished, 30,000 silkworms were fed with food sprayed with water in which were the macerated remains of an infected silkworm. They all died before reaching maturity, mostly on or shortly after the fourth day. A similar experiment was made, using an infected cotton worm instead of a silkworm; the worms did not die so quickly, but no larva reached the spinning stage. Later, in May 1913, cotton worms were infected by food sprayed with water containing a single macerated diseased silkworm; in three days 50 per cent. had succumbed, only six survived to pupate, and it was not expected that these would emerge.

As the cotton worms in the field were rare, it was not possible to test these experiments on a large scale in the open. The method that would be adopted in the open would be to disseminate the disease by artificial spraying of the plants with water containing infected larvae. Investigations were, at the time of writing, not sufficiently complete to make it possible to say what the effect of climate would be on the infective power of the disease, but there is no doubt that the rainless climate of Egypt would facilitate its dissemination by spraying.

PEACOCK (A. D.). Entomological Pests and Problems of Southern Nigeria.—Bull. Entom. Research, London, iv, pt. 3, Nov. 1913, pp. 191-220, 2 figs., 6 pl.

This report deals with the investigations made by the author is Southern Nigeria in 1911-1912. Insects attacking cotton are the cotton stainers (Dysderens superstitiosus, F., and Orycarenus dudgeous, Dist.); boll-worms (Diparopsis castanea, Hmp., Earias biplaga, Wh. and Chloridea obsoleta, F.); leaf-rolling caterpillars (Sylepta derogous, F., and Zebronia phenice, Cram.); cotton aphis (Aphis gossypii, Glov.), leaf-cating beetles (Coccinellidae: Epilachna chrysomelina, F., E. similis, Muls.; Lagridae: Lagria villosa, F., and L. viridipenno, F.; Curculonidae: Siderodaetylus sp.; Chrysomelidae: Syngarus calcuratus, F., Plagiodera circumcincta, Sahlb., Ootheca mutabilis, Sahlb., and Nisotra uniforma, Jac.); leaf-cating caterpillars (Euprotesp., E. lyonia, Swinh.); scale-insects (Pulvinaria jacksoni, Newst., and Ripersia sp.).

The study of the Red Cotton Stainer (Dysderens superstitiosus) occupied considerable attention; it is the worst pest of Southern Nigerian cotton, and does an immense amount of harm both to the seed and to the lint. It is widely distributed in the Colony, being mostly in evidence during March, the time of the ripening and shedding of the seed of the silk-cotton tree, and from September to the end of November 10 the silk-cotton tree, and from September 10 the end of November 10 the silk-cotton tree, and from September 10 the end of November 10 the silk-cotton tree, and from September 10 the end of November 10 ber, during the ripening of the cotton bolls. The bugs suck the juices of the rich oily seeds of the cotton, Hibiscus and silk-cotton tree, and stain the white lint of their food-plants with yellow excretory juices. The eggs are laid in clusters, the average number in each being about 63. The breeding period lasts for about 9 to 10 weeks; the newly hatched young soon become active, and crawling up the cotton stalk, swarm upon the opened bolls and suck the cotton seed; there are five moults. Natural enemies have not been discovered. It is of great importance to keep the plantations free from all weeds, etc.; the presence of the silk-cotton tree has also been shown to be prejudicial. Collecting the stainers is best undertaken early in the cotton season. A collecting net suitable for the purpose is described and figured. The planting of trap-crops to entice the stainers away from the cotton plants is suggested, but was not tried. General measures are recommended, such as gathering the cotton as soon as it is ripe, sunning it well, and constantly turning it over, which causes the stainers to crawl away. and the burning of old cotton-stalks, which harbour the pest. Some foreign cottons are not so liable to attack as the native varieties, but their lint-bearing qualities are not so good.

The Black Cotton Stainer (Oxycarenus dudgeoni) is also widely distributed; it appears in November. The insect feeds and breeds

the opened cotton bolls, sucking the juices from the seeds. The eggs had had in clusters of apparently about 20; the wingless young swarm December. Their favourite food-plants are species of Hibiscus. The extent of the damage they do has not been estimated exactly, their abundance suggests that it is considerable. The remedies prior attention of the Red Cotton Stainer apply equally to this species.

The boll-worms mentioned above are widely distributed; the aterpillars bore into the unopened ripening cotton bolls and devour the seeds inside, while Diparopsis castanea and Chloridea obsoleta eat the flower-buds also. The damage is serious, and so far no natural elemies have been discovered. Spraying with lead chromate is the test effective remedy. A careful look-out should be kept for leafneders and boll-worms during August and September, and immediately their presence is detected the leaves, bracts, bolls, and buds should be throughly sprayed; the number of sprayings must depend upon the condition of the crop as the season advances; at the end of the season advances with effectively control the various leaf-eating caterpillars.

The cotton aphis (Aphis gossypii) is kept well in check by natural casmies, including lady-bird beetles (Chilomenes lumin, F., and C., ma, Muls.), hover flies (Paragus borbonicus, Meq., Syrphus aegyptius, Wad., and S. nasutus, Meq.), and lacewing flies (Hemerobius sp. and Chepsopu sp.).

The inserts affecting cacao are leaf-eating caterpillars (Diacrisia nodosa, Stoll, Diacrisia sp., Prodenia litura, F., and Rhopolocampta forestin, Cram.); leaf-eating beetles (Adorctus hirtellus, Castn.); a pol-horer (! Myelois)*; scale-insects (Pseudococcus virgatus var. adoptisectricusis, Newst. and P. citri, Risso).

The measures for combating leaf-eating caterpillars and beetles is side themselves into:—(1) clean farming; (2) the segregation of engo-beds from maize, since many pests of the latter migrate to the vector; (3) a combination of hand-collecting and spraying with Paris green or lead arsenate.

Red tree ants (Oecophylla) are not harmful to cacao trees, but their presence adds a difficulty to the collecting of the ripe pods, owing to their vicious bites. The best method of combating them is to cut down their leaf-nests and destroy them. An Ichneumonid, Metopius discolor, Tosq., was bred from Prodenia litura, and a Tachinid fly of the genus exproper from Diagrisia macalosa.

The author says that the general condition of the native cacoa farms is at present bad, the chief defects being that the land is not thoroughly chared and stumped; that the trees are not planted so that they may be readily worked; and that decaying branches and pods are left on the trees and on the ground.

The insects recorded as affecting maize are Cirphis? phaea, Hmp., C. hamistes praepallens, Hmp., C. fusca, Hmp.; leaf-cating beetles [Louria villosa, F., and L. viridipennis, F.), and the locust, Zonocerus variegatus, L. C. phaea should be combated by burning the grass or

^{*!}From specimens received from Mr. W. H. Patterson, Government Entomologist in the Gold Coast, this insect proves to be Characoma sheltaqanda, Hmp., a Noctuid moth of the sub-family Sarrotherina. The species was also bred from the fruit of kola by the late Mr. L. Armstrong in the Gold Coast.—Ed.]

bush round the fields; when once the caterpillars have gained the maize plants damage can only be prevented by spraying. Not enough work has been done upon the other pests of maize to warrant giving specific remedies.

The insects recorded as damaging yams are the beetles, Prionoryate caniculus, Arrow, Crioceris licida, Dalm., Apomecyna parampunctata, Chev., Lagria villosa, F., and L. viridipennis, F., and Zonocerus variegatus, To combat P. caniculus spraying with a stomach poison is suggested, a method which applies also to C. livida.

The larvae of the following moths are recorded as affecting Funtunia rubber: Glyphodes ocellata, Hmp., Nephele aequivalens. Walk., which is of rare occurrence, and Thermopteryx elasticella, Hmp.; also a

Thrips, Physothrips funtumiae, Bagn.

Mahogany trees (Khaya senegalensis) suffered from the attacks of lepidopterous larvae, which bore into the stem. Arabian coffee is affected by a beetle, Ootheca mutabilis, Sahlb., and the bugs, Antesia variegata, Thunb., Riptortus tenuicornis, Dall., and Dictyopharina serene, Stül. Other plants attacked by insects are recorded, namely the oil palm, attacked by a weevil, Rhynchophorus phoenicis, F. the coconut palm, by another weevil, Temnoschoita quadrimaculata (iyl.; kola, by a Rutelid beetle, Adoretus hirtellus, Castn.; and okra by various cotton pests.

The author concludes by pointing out the need of pioneer entonological research, which is essential before the necessary instruction with regard to insect pests can be given to the native farmers.

GROSSHEIM (N. A.). Нъ біологій люцерноваго долгоносика и его паразитовъ. [On the biology of *Phytonomus murinus F*, and its parasites.]— «Знтомологическій Въстникъ» [Messenger of Entomology.] Kiev, ii, no. 1, 1913, 21 pp.

This investigation was undertaken upon a request from the Department of Agriculture of the United States, transmitted through N. V. Kurdjumov, for information concerning the parasites of *Phytonomic murinus*, the lucerne weevil. The author conducted his enquiry in the province of Kuban, where, according to him, these insects threaten to develop in the near future to a dangerous degree.

The hibernating beetles emerged during April, but disappeared again under the earth or inside the plants on cold days. Just after emergence the insect does not touch the leaves, but feeds on the summit of the stem, in which it gnaws holes. The eggs are usually deposited in the tender ends of the stem, but also on branches, and frequently near the roots. As a rule, the females prepare a hole in the stem for the reception of the eggs, but occasionally they make use of the stipules, piercing through them and depositing the eggs in the space between them and the stem. The eggs are most frequently arranged in small heaps, which are often roughly conical and sometimes egg-shaped or more rarely, they are laid in a chain-like row of not more than nine eggs; or again, when deposited on the stipules, they are arranged in a flat-topped pile perpendicular to the stem. The eggs are usually covered by a layer formed of the excrement of the female, but sometimes this is absent, the last egg serving as a cover for the heap. The author figures the various types of egg-heaps, and gives a table

containing his observations on the mode of oviposition by one female, Ach deposited in one and a half months 690 eggs in 47 heaps; in groundle weather there were up to five ovipositions daily, while in i weather none took place. Oviposition proceeds from the end of Wirch to the end of June, but the number of the beetles decreases secondly from the middle of June.

The development of the larvae inside the eggs occupies from four to at days, depending chiefly on the weather conditions; apparently larvae which issue first remain inside the egg-cluster till the other larvae appear, as their exit from the heap always takes place at the same time. The author describes and figures the various stages of the larvae, the progressive changes in their habits, and the injuries done to the leaves. The cocoon is constructed among the leaves, The, or sometimes only two, leaves being drawn together into the form of a tube. The pupal stage lasts from six to eleven days.

Parasites were found of all the stages of Phytonomus murinus. . The . 22s are attacked by a small Pteromalid, which has not been identified, Tas insect proved to be an external parasite, laying only one egg in an errheap of the Phytonomus; the larva, after feeding on the eggs of the host, pupates without a cocoon inside the heap, the pupal stage tasting 13-15 days. The whole development of the parasite lasts from ture to four weeks, so that only two broods of it appear during the scanner; in the year of the author's investigations, the percentage of eggs infested by this parasite was 13:33.

Canidiella carculionis, Thoms., infested 3 16 per cent, of the larvae of P. murinus. This external parasite attacks the larvae of the host in their latest stages, and the infested larvae prepare a cocoon, but do not pupate. The parasitic larva pupates inside the cocoon of the beetle remaining there during its whole pupal stage, which for the second generation of the parasite lasts through the winter. The corpon of the parasite possesses a remarkable power of jumping, which the author explains, accompanying his explanations by drawings. He suggests that the purpose of this jumping is either to protect the pupa from hyperparasites, or gradually to destroy the cocoon of the nost. Some undetermined PTEROMALIDAE were found to be hyperparasites of C. curculionis; cocoons of the parasites so infected less their jumping power, besides turning transparent and bright

The larvae of P. murinus are also infested by two Chalcids, Tetrastohus sp., which is a primary internal parasite, and Dibrachoides Pteromalus) dynaster, Först., an external parasite; the percentage of infection by these two species is low.

As to the parasites of the pupae of P. murinus, there were noticed Edophus sp., an external parasite, and Pimpla maculator, F., an internal one; one specimen of the latter was also bred from a larva of the host. This Ichneumonid is much the most important parasite, 45 per cent, of the pupae were attacked by it. Catolaccus alter, Patzh., was obtained as a hyperparasite of Pimpla maculator.

Besides parasites, there were noticed also as enemies of P. murinus, the larvae of Chrysopa sp., which destroy the cocoon of the weevil and feed on the pupa, and a small red acarid. All these enemies and parasites together destroyed in the season under consideration, 71 per

wat, of P. murinus.

The author deals further with remedies, which can be best applied against the larvae, as all other stages are more or less effectively protected. He mentions the following measures:—(1) Floeding of the lucerne crops, which remedy cannot however be of important under the conditions prevailing in the Russian steppes; (2) drawitz a wire broom over the field; (3) harrowing with a disc harrow, which is the best remedy; and (4) burning with naphtha.

GOLOVIANKO (Z.). Таблицы для опредъленія наиболье обыкновенных в личинон пластинчатоусых жуков [Identification tables for the more common Lamellicorn larvae.]—Pubd. by A. F. Devrien, St. Petersburg, 1913, 26 pp., 108 figs., 3 tables.

The tables contain descriptions of the larvae of the following beetles, many of which are important pests: Meloloxyhidae: Melolomismeloontha, L., M. hipporastani, F., Polyphylla follo, L., Amoria pilos, F., Rhizotrogus solstitulis, L., Serica brunnea, L.: Rutelipae Phyllopetha horticola, L., Anisophia deserticola, Fisch. A. segutom-Hist., Anomala praticola, F., A. acnea, de G.; Cetoniume: Cetocaurata, L., Epicometis hirtella, L., Orythyrea stictica, L., Osmodera: eremita, Laxm., (Inorimus nobilis, L., Trichius orientalis, Reitu. Dynastidae: Pentodon monodon, F., Orycles musicornis, L., Geotrupidae: Geotrupes stercorarios, L., Lethrus apterns, Lamiaphoniumae: Aphodius subterrancus, L.; Lucanius cerco. L., Dorens parallelopipedus, L.

CARSON (G. M.). List of insecticides and fungicides. Entom. Notes. Territory of Papua, Dept. Agric., Port Moresby. Series A, no. 5, 15th Sept. 1913, 3 pp.

The following spray mixtures are tabulated: Lead arsenate Lead arsenate I lb., water 100 gals.; kerosene emulsion (a); so soap 1 quart, hot water 2 quarts, kerosene 1 pint; kerosene emulsion (b); hard soap 1 lb., boiling water 1 gal., kerosene 2 gals.; red of mixture; red oil 1 gal., soft soap 1 lb., water 14 gals.; resin compound powdered resin 3 lb., washing soda 3 lb., water 1 gal.; Bordeaux mixture; bluestone 6 lb., lime (unslaked) 4 lb., water 40 gals Concise instructions for preparing these and remarks as to their are given. The list of chemicals, sprayers, etc., and the section headed "General Notes," are of practical value.

PRATT (H. C.) and SOUTH (F. W.). Progress Report on Locust Work since June 1913.—Agric. Bull. F.M.S. Kuala Lampur, ii, no. 3. Oct. 1913, pp. 53-59.

The authors report that in Negri Sembilan and Selangor there was a marked increase of locusts during the first part of the year 1943. Destruction of large numbers of hoppers has been carried out, though the work was only in the experimental stage. By far the most important of the food-plants of these insects are grasses, especially "lalang" and "love-grass," commonly found along the roads in thee districts. These form their staple food supply, but should the insects

continue to increase as they are doing, other food will be required. It has been reported that young coconuts have been destroyed by continued attacks of flying locusts and hoppers have eaten down the paddy to below water-line. Of the garden plants, the bamboo is very liable to attack. Tennis-lawns, golf-greens, padangs and race-courses have been rendered brown and unsightly by these insects in a few hours. In the Malay kampongs, sugar-canes, bananas, pine-apples, paddy and coconuts have been eaten. Slight damage has also been done to rubber trees by the weight of the insects settling on the branches or main stems of young plants causing them to snap. The rubber leaves are only occasionally nibbled.

The driving and pit system of dealing with these insects used in other parts of the world entails an immense labour force, and much expense in digging ditches, and on this account can only be used for small swarms in the Malay States, where a large amount of labour is not generally available. Moreover, the hoppers are able to get out of the nots of almost any depth, unless killed upon entering them or prevented from escaping by a gang of coolies or other means. Another method, not used in Malaya, is that of driving the hoppers into drainage ditches, where kerosene has been added to the water. This surface film of kerosene on the water soon causes their death. Arsenical poisons are probably effective, but considered too dangerous for use, since the poisoned grass is liable to be eaten by animals. Spraying with kerosene, where used in strong emulsion, has deadly effects, but the damage it causes to the rubber fittings of the sprayers has prevented its use on a large scale. The only practical method in such a country consists in driving the young hoppers into V or W-shaped enclosures, which end in special traps constructed for the purpose, and which can be erected in three minutes by three coolies. The traps consist of strong canvas bags, the entrance to which is two feet high, and is approached by an inclined plane 4 feet each way, which is also the width of the bag. The remaining two sides and back of the bag are t ft. 6 in. high, and the two sides are prolonged into two wings 4 ft. in length, and attached at the bottom to the sides of the inclined plane, The whole is supported by iron stakes, furnished at the top with hooks from which the bag is suspended by steel rings, sewn on to the material at the corners. The same means is also used to support and stretch the wings. The shape of the bag is preserved by four bamboo poles run through folds two feet from the ground. These bamboos are held in place by iron stakes with rings at the top. Against the front bamboo the inclined plane is stretched, being held in position by a bamboo, run through a fold at the bottom and fixed to the ground by short iron or other stakes. To prevent the escape of hoppers below the wings and inclined plane, a little earth is thrown on the wings and in front of the inclined plane.

The escape of the hoppers from the bag is prevented by strips of American cloth from 6 ins. to 12 ins. wide, which are sewn on the inside from the height of the opening downwards. The sides of the enclosure consist of strips of strong calico 4 feet 6 inches wide and 15 yards in length. This material is very portable. On the inside two parallel strips of American cloth 6 inches wide are sewn at the height of 3 feet and 4 feet from the bottom. At the top is attached a rope strongly sewn on with twine, leaving apertures every inch. The shecting is

suspended from iron stakes 1 feet 6 inches in length, furnished with a hook and over which the rope is hung. The sheeting is held down by a continuous line of soil heaped on its free edge.

A quarter of a mile of this apparatus can be placed in position before an advancing swarm by ten proficient coolies in half an hour. Moreover, it is easy when the swarm is inside the enclosure to cut off their retreat by closing the open end of the V or W. It has been found that when a large swarm of hoppers has eaten out the available food supply behind it that they will pour into trap bags for eleven hours without stopping, necessitating the erection of further traps, or changing those that are full, and this with practically no driving. It is a remarkable sight to see these insects hopping towards the trap, pouring up the inclined plane and dropping into the trap in a stream that is almost as regular as a stream of water, killing each other by their weight and struggling inside the trap. Circling out of the V may occur, but can be stopped either by placing subsidiary traps on the arms of the wingand facing the original trap, or, which is easier, by modifications in the erection of the sheeting. In most cases it is desirable to drive the swarms by means of coolies placed behind them. In one instance, near Setapak village, with three traps, 300 yards of sheeting and 15 coolies, about two million insects, a portion of a swarm, were destroyed during the day. Rewards offered to natives for information as to the locality of breeding grounds or hoppers have been the means of locating hundreds of swarms.

PRATT (H. C.). The Locust Pest in Malaya; a Short Survey and a Brief Description of its Life-History. -- Agric. Bull. F.M.S., Kuula Lumpur, ii, no. 4, Nov. 1913, pp. 76-80.

Before organising the campaign against the locust pest several methods of control were tried, and the most successful was found to be the driving and trap system. No reliable information as to the origin of these insects is available. They first appeared in the Malay States about 20 months ago in the neighbourhood of Port Dickson, and since then have spread, mostly in a northerly direction, over 100 miles of country. The life-history of the locust has now been completely worked out, and the details are given. The species does not appear to have been identified.

SOUTH (F. W.). Work on Locust Destruction in September. Agric. Bull. F.M.S., Kuala Lampur, ii, no. 4, Nov. 1913, pp. 85-88.

In Selangor there were three main centres of distribution of hopping locusts, the district of Ulu Selangor, the neighbourhood of Kuala Lumpur and the district between Kuala Lumpur and Kajang. In each district was a Special Assistant who employed at first only one or two gangs, though these were increased later as fresh supplies of apparatus were obtained. The results of the month's work were 5.322 kerosene tins full of hoppers in all stages, representing 104 swarms. In addition, 2.083 kerosene tins of hoppers were reported to have been captured by the Malays in Kuala Kubu districts, working independently with their own apparatus, copied from that used by the Department. In Negri Sembilan, at the end of the month, two breeding grounds and one

carm of hoppers had been reported in the Tampin districts. In the treast district numerous small swarms occurred, and the Special Assistant with one gang destroyed 42 swarms. The deficiency in the amount of apparatus has constituted a severe handicap on the work. The damage caused by the locusts has not been very serious.

Maskew (F.). The Gunworm of the Grape.—Mthly. Bull. State Commiss. Hortic., Sacramento, ii, no. 10, Oct. 1913, pp. 677-679, 2 figs.

The material used for this description of the gunworm (Sciopteron 1997), a Sesiid moth, was taken from some confiscated vine-catings brought from Yokahama to San Francisco by a passenger, swellings on the twigs indicated some abnormality, and were found to act in the larvae of a Sesiid borer. These larvae bore into the canes of the grape-vines and are very destructive in Japan. The paper concludes with a description of the life-history of the insects by E. O. Essig.

Essia (E. O.). The Western Twig Borer. Mildy. Bull. State Commiss. Hortic., Sucramento, ii, no. 10, Oct. 1913, pp. 681-684, 3 figs.

The author received twigs of apricot trees severely injured by a Bestrychid beetle, Amphievrus principennis, Lec. The burrows, which eav occur anywhere on the twigs, vary from one to three inches in leading and are about one-eighth of an inch in diameter. The beetles been not to the twigs for food and protection, not to deposit eggs, and the triows cause the smaller twigs to break. This species seems to prefer deal or dying wood. A desert plant (Prosopts juliflora, D. C.), is reported by Dr. Van Dyke as the normal food plant, and other known bosts are pear, dead fig-tree branches, dry causes of the grape-vine, agricot and dry orange wood. It has a wide distribution in South West California, Dr. Van Dyke specially mentioning Los Angeles and Imperial Counties. Control measures suggested are, the destruction of breeding places if possible, the elimination of unhealthy trees and all sead wood, and the maintenance of trees in good growing vigour.

VALLE (R. S.). Effects of Hot Weather on Lemon Trees Sprayed with Lime-Sulphur. Mthly. Bull. State Commiss. Hortic., Sucramento, ii. no. 10, Oct. 1913, p. 692.

Lemon trees sprayed with both Rex and Ortho lime-sulphurlations ten days before the excessive heat were found to be very seconstly burned, and a large proportion of the fruit was completely fixed. The author states that he has never seen spray injury due best arise after so long an interval.

VOSLER (E. J.). Calendar of Insects Pests and Plant Diseases. Milly Bull. State Commiss. Hortic., Sucramento, ii, no. 10, Oct. 1913, pp. 695-699, 1 fig.

Among the deciduous and citrus fruit insects the fall cankerworm Alsophila pometaria, Harr.) is known as a pest of apple, prune, cherry, and apricot. The eggs are attached to the bark in masses of from

60 to 200, placed in exposed situations by the wingless females which emerge from the middle of October to the middle of December. Thuse of bands around the tree trunk, placed in September and October, has been recommended to trap the females as they ascend the trunks to deposit their eggs.

The use of distillate emulsion for spraying for the black scale on olive is recommended by E. O. Essig, his formula being 20 gals, of distillate (28 degrees Baumé), 30 pounds of whale-oil soap and 12 gallons of water; dissolve the whale-oil soap in the water, heating it to the boiling point, add the distillate and agitate thoroughly while the solution is hot; for use, add 20 gals, of water to each gallon of the above mixture. The crude oil emulsion (formula given below) is also recommended. For the brown apricot scale, Essig recommends spraying with caustic soda and distillate, or distillate emulsion and crude oil emulsion, when the trees are dormant. The formula for the distillate emulsion is the same as that for the black scale. The formula for the caustic soda mixture is: Water, 200 gals.; caustic soda (95 per cent.). 7 lb.; and 10 gals, of distillate (28 degrees Baumé). Fill the spray tank with the required amount of water, add the caustic soda which has been dissolved in a small amount of water, and then add the distillate: keep the agitator going rapidly while applying the spray. For the crude oil emulsion the formula is; Water, 175 gals.; liquid soap, 3 gals.; and crude oil (direct from wells) 25 gals. Fill the spray tank with water, add the liquid soap, agitate for one minute, then add the crude oil, continuing the agitation while the spray is being applied. Funigation is also recommended as soon as possible after the young scales are hatched. Three-fourths or even half of the regular schedule No. I may be used, a two-thirds dosage appearing to do as well as a

Among the cereal and forage crop insects, the clover seed Chalcid (Bouchophogus funchris, How.) is reported as a serious pest. This Chalcid will infest the seed of red and crimson clover, besides alfalfa, a favourite host: they feed on the substance of the seed and often totally destroy the contents. The eggs are deposited in the seeds. The adults do not emerge from the seeds till the following spring or early summer. Remedies for this pest are in an experimental stage. Professor F. M. Webster suggests as a preventive measure the destruction of all outstanding alfalfa plants in the autumn, the chaff and stems to be burned. Delaying the seed crop by early pasturing or clipping of the first growth in the spring until the seed Chalcid has done most of its destructive work, promises to be useful as a control measure.

For the destruction of locusts or grasshoppers a mixture used by the Government of South Africa is recommended. This consists of our gallon of treache mixed with one half gallon watery solution of arsenits of soda (69 per cent, white arsenic). This mixture is diluted for newly-hatched locusts to one part to 66 of water; when used against locusts two weeks old, it is diluted one part to 50 of water. Where the application is made in fields not accessible to domestic animals, farmers have used it as strong as one to 30 or 40. Since the egg-masses of grasshoppers are deposited in the hard, uncultivated lands during the late summer and early autumn, ploughing, harrowing, and disking such waste lands to a depth of several inches in the late autumn will lessen future attacks.

For the destruction of the alfalfa caterpillar (Autographa gamma californica, Speyer), renovation of alfalfa fields during the winter months is recommended. This will destroy large numbers of the laborating pupae. Pasturing the fields will also aid in the destruction of the resting stage of this insect. Among the truck crop insects the corn ear worm (Chloridea obsoleta) has been reported as causing much damage to tomatoes. The use of an early trap crop, as well as early maturing varieties, the hand-picking of infested tomatoes to prevent the larvae spreading, autumn ploughing of infested ground, and the proper disposal of unsaleable infected tomatoes, will help in the protection of the next year's crop.

Essig (E. O.). Insect Notes. Mthly Bull. State Commiss. Hortic., Surramento, ii, no. 10, Oct. 1913, p. 705.

Asterolecanium variolosum has been reported as working on oak trees at Stackton by F. Maskew. Young pine trees (Pinus radiata, Don.) have been seriously damaged by Ips (Tomicus) confusus. A new Kremes has been found working on Quereus agrifolia, Nec.

STRONG (L. A.). A Fortunate Find. Mthly. Bull. State Commiss. Hortic., Sacramento, ii, no. 10, Oct. 1913, pp. 709-711, 1 fig.

Examination of "Kamani nuts" (Terminalia catappa) brought from Honolulu and destined for planting in Southern California, showed them to be badly infested with living larvae of the Mediteranean fruit fly (Ceratitis capitata, Wied.), and they were consequently confiscated. Had this been overlooked the worst known insect pest of fruit and vegetables would probably have been established in California.

VOSLER (E. J.). Zebra Caterpillar (Mamestra picta, Harris).—Mthly. Bull. State Commiss. Hartic., Sacramento, ii, no. 11, Nov. 1913, pp. 713-715.

The eggs of this caterpillar are deposited on the alfalfa leaves, and hatch in a few days. The young larvae eat the epidermis of the leaves, which soon appear whitish from their attacks, and they web the tops of the alfalfa stalks together. In the young stages the larvae work in colonies and only on the upper more tender portions of the plant. In an alfalfa field at Salt Lake, Utah, it was noted that in the latter part of September and in the early days of October when the leaves of alfalfa were becoming too tough, the larvae migrated to the edges of the field to feed on the tender growth of dock. From September to October the caterpillars enter the soil to pupate. At present the best method of control for this pest is picking and destroying infested tops. If the fields are pastured at this time of the year little damage will result from this insect's attack. This moth occurs in the Atlantic States, Colorado, Utah, and California. It also attacks cabbage, celery, beets, and other garden vegetables. A species of Tachinid fly and an Ichneumonid (Campoplex) have been reared from M. picta The Campoplex emerges from the larva at about the third stage.

Essig (E. O.). A Serious Philippine Orange Moth.—Mthly. Bull. State Commiss. Hortw., Sucramento, ii, no. 11, Nov. 1913, pp. 722-723, 1 fig.

The author states that Professor C. F. Baker has called particular attention to a small moth which works in a variety of native orange in the Philippines, called the "cajel." It has been determined as Prays cdri, Mill., of which Prays asphelomima, Meyrick, is a synonym. The larvae of this moth live just beneath the rind next to, but not in, the pulp. They produce gall-like tumours, which are often exceedingly numerous, and which remain open at the tips, affording excellent germinating places for destructive fungi. The opening is usually about one-eighth of an inch in diameter. The danger of the introduction of this moth into California is greatly reduced by the quarantine laws, which are being maintained against all countries where the fruit flies (Tryperfove) are known to exist. The recognition of the pest by quarantine offices may prevent its introduction from some other section of the world where these laws do not apply.

General Notes. Mthly, Bull. State Commiss. Hortic., Sacramento, ii, no. 11, Nov. 1913, pp. 724-728, 731.

E. O. Essig notes some of the discoveries of Professor C. F. Baker in the Philippine Islands with regard to fruit flies. The melon maggot, Davas caeurbitae, Coq., is abundant there; and another fly, the maggots of which he found swarming in wild oranges, proved to be a new genus and a new species named by Bezzi, Monacrostichus citricola, Professor R. W. Doane has recently collected the Queensland fruit fly, D. conatos, Coq., on the Island of Tahiti. All these fruit flies are serious pests, so these records are of value to the horticultural quarantine departments. E. O. Essig also quotes the formula of a spray for the control of tomato Thrips, devised by R. T. Watson, of the Florida Agricultural Experiment Station, which, on a trial piece, killed 78 per cent. of the Thrips. The mixture consists of commercial lime-sulphur (33° Baumé), 5½ gals.; "Black-leaf 40," 14 fluid ounces: water, 200 gals.

A. J. Cook records the occurrence in California of an as yet undescribed weevil, which was found in large numbers doing no little damage to the tender foliage of apricot trees. The occurrence of a new species in large numbers all at once is difficult to explain. Possibly it is an importation or it may have come from some indigenous wild plant. This new beetle is an Otiorrhynchia allied to Fuller's rose beetle. Araniqus fulleri, the larvae of which feed upon the roots of roses raspberries, blackberries, and other rosaccous plants. It is not known upon what this new pest feeds in the larval stage; the beetle does not appear till midsummer.

C. W. Beers reports a millipede doing considerable damage to the tender roots of vines in Santa Barbara county. B. R. Jones also reports it as doing serious harm to lettuces: it feeds largely on decaying vegetable matter. The dark blue blister beetle, Cantharis stygica. Lec., is reported to have done considerable damage to buds and blossoms of asters in Philo, Mendocino County, Cal. The red-humped caterpillar, Schizura concinna, S. and A., has been attacking the foliage

of apples, prunes, cherries, pears, and walnuts at Modesto. R. S. Vaile has reared from Aspidiotos hederae, Vall. Aspidiotiphagus citrinus, Crwf., and Aphelinus fuscipennis, Howard. Chelonus shoshoncanorum, Vier., has been reared from the potato tuber moth. Phthorimaea operculella by H. A. Weinland of San Diego County.

VOSLER (E. J.). Calendar of Insect Pests and Plant Diseases. Mthly. Bull. State Commiss. Hortic., Sacramento, ii, no. 11, Nov. 1913, pp. 729-730.

The squash bug winters in the adult stage under rubbish and among old vines. Clean culture is therefore an important remedial measure. Insects in stored products, such as the grain weevil, pea weevils, flour moths, etc., are best checked by fumigation with carhon bisulphide. An air-tight fumigating room is an essential. Pour the carbon bisulphide into shallow dishes and place in the bins, using 5 lb. to 1,000 cubic feet of space. The temperature should be 70° Fahr, or above for the best results. Insects in greenhouses, such as red spiders and mealy bugs, are best checked by syringing the plants forcibly with water two or three times a day. The caterpillars of the California tussock moth feed upon young fruit and foliage. This pest spends the winter in the egg stage, the eggs being in masses attached to the trunks of trees and adjacent objects; the hand-picking of egg-masses will greatly reduce their numbers.

Ballard (E.). Pests of Stored Grain.—Supplement No. 4 to the Nyasaland Government Gazette, Zomba, xx, no. 12, 29th Nov. 1913, p. 298.

A short account is given of pests of stored grain in Nyasaland, the twp chief of which are the Grain Moth (Sitotroga cerealella, Ol.), and the Rice Weevil (Calandra oryzae, L.). With these is often found another beetle, Tribolium confusum, Duv., which, however, does no scrious damage. Fumigating with carbon bisulphide is recommended.

FRENCH (C. Jr.). Insect Pests of the Potato.—Jl. Dept. Agric. of Victoria, Melbourne, xi, pt. 12, Dec. 1913, pp. 729-748, 13 pl.

The dreaded Colorado beetle and a few other pests prevalent in America and elsewhere are absent from Australia, and with the careful inspection and quarantine in Melbourne of all potatoes arriving from abroad, growers have little fear of new pests being introduced. The Potato Thrips, Thrips tabaci, Lind., has caused considerable losses, and appears to be on the increase. They attack plants of all kinds. If débris is examined during the winter, they are found in great numbers; the first warm days of October brings them out in thousands, and on the underside of the potato leaves they will be found in varying stages of development. Total development occupies 10–15 days in Victoria. The thrips pest is a serious one, and unless definite measures are taken against it, it will be impossible to grow good crops; the lower leaves of the plant are attacked first and as these are destroyed the top ones are affected in turn. All débris on potato fields should be destroyed; by this means hibernating insects and their eggs will be

eradicated. Various spraying methods have given good results. Mr. G. Seymour and the author used tobacco wash with a Strawsonizer spraying outfit; the formula for the tobacco wash is as follows: Steep 4 lb, of tobacco in 1 gal, hot water, and soak for 24 hours; boil 11b. soap in 1 gal. water; strain the tobacco water into the soap water; stir. and make up to 5 or 6 gals. Benzol emulsion, costing about 4d. per lb., has proved effective; 1 lb. makes 5 or 6 gals. of spray. Hellebore or a weak kerosene emulsion has also given good results. In America the use of lime in the following proportions has been recommended; 35 lb, lime to 190 gals, water. Mr. Moulton, who has experimented with thrips in America, advocates the use of oil and water in making up the tobacco spraying fluid, and gives the following formula: Distillate oil emulsion, $1\frac{1}{2}$ to 2 per cent. solution; black leaf tobacco extract, I part to 60 parts of water. The distillate oil emulsion is prepared as follows: - Hot water, 12 gals.; white oil or fish oil soap, 30 lb.; distillate oil (23 degrees, Baumé), 20 gals. The soap is dissolved in a kettleful of boiling water and poured into the spray tank: the oil is added and the mixture agitated violently, and sprayed under a pressure of 125-150 lb, into other barrels. This stock solution is diluted before use with 24 gals, of water to cach gallon of solution. As a deterrent against thrips coal-tar water has been recommended. Boil 11b. coal-tar in 2 gals, water, and while hot, add from 50 to 100 gals, more water.

Cutworms and looper caterpillars, army worms, etc., have been destructive to potato crops. Especially mentioned are the Silvery Moth (Plusia argentifera), the Potato Looper Moth (P. verticillata). t'hloridea obsoleta and Lencania sp. By the eradication of weeds and the burning of haulms and stems of harvested crops, many eggs are destroyed. Placing bandles of succulent plants, which have previously been dipped into a mixture of Paris green (1 oz. to 39 gals, of water) between the rows of potato plants will kill a large number of the caterpillars, and is harmless to the potatoes. Poisoned bran has been successfully tried, especially against the Silvery Moth. The author recommends the poisoning of lucerne or other green stuff, to be distributed as a bait. One lb. of arsenate of soda is dissolved in 10 gals. of water, to which 8 lb. of treacle or brown sugar is added; the green stuff is moistened with the liquid and scattered broadcast, preferably a few days after the ground has been ploughed. Where a spray is used instead of bait, arsenate of lead has proved one of the best. The trench system is a simple and effective method of eradication; a trench is dug around the crop, it must have clean cut sides, and the sides nearest the crop should be undercut to prevent the worms from crawling out of the trench. Deep holes should be made in the trench at intervals of about five yards. When travelling towards the crop the cutworms fall into the trench, and crawling along it fall into the holes. where earth should be thrown over them and pressed down.

The Potato Moth (Phthorimaea solanella, Boisd.) is the worst potato pest in Australia. The young larvae usually feed upon the eyes of the potato; they then tunnel towards the centre of the tubers, causing them to turn brownish-black, and inducing decay. The pupae are attacked by various parasites and bacterial diseases, which destroy great numbers. All débris in the fields should be burnt. Seed infected with the grubs should never be planted, nor should ground where

affected potatoes have been grown be used again for the same crop. Potatoes should never be left exposed in the field or store-room, but laced at once in bins, pits or any other receptacle where the moths amout reach them. Trapping by means of lamps is of use in destroy-leg the moths, which fly at night. Spraying the crops, when the moths begin to appear is advisable, as this will destroy the young grubs as soon as they begin to feed. A good arsenical spray is prepared as follows:—Boil 1 lb, white arsenic and 2 lb, carbonate of soda (crystals) in 1 gal, of water for 20 minutes; separately dissolve 7 lb, arsenate of the distribution of the distribution of the first them both mixtures are cold, mix them together. Bottle into twelve 1-pint bottles, and use one bottle to goods, of water. Mix the chemicals in wooden buckets.

The Potato and Tomato Weevil (Desiantha nociva, Lea) is a comcaratively new pest of the potato. It does considerable damage, and both larvae and adults are equally destructive; it is a prolific breeder, and every possible means should be taken to prevent its spread. All weeds, especially marshmallows, on land adjoining potato crops should be destroyed. Arsenate of lead spray has been experimentally

proved to keep the pest in check.

Jassids, Leafhoppers or Froghoppers are found in large numbers, casionally doing damage to young leaves and shoots. If the damage bels fair to be serious it would be necessary to spray the crop with henzolemulsion, I lb. to 5 gals, of water.

The Rutherglen Bug (Nysius vinitor) is one of the most destructive of plant bugs in Victoria. The prevention and remedies are those

which are recommended for thrips.

A large number of species of wire worms (ELATERIDAE) are found in Victoria, where however, they do not make much headway, owing no doubt to natural enemies. One of the best methods of keeping wire worms under control is to turn the ground over frequently, exposing toginsects to birds. Poisoned baits, made by cutting up a few turnips, earots, etc., and soaking them in arsenate of lead, have given good results. Manurial insecticides worked into the soil have also been tried with success.

The Victorian White Ant (Termes lactis, Froggatt) is a destroyer of timber and furniture, as well as apricot, plum and other fruit trees, vines, potatoes, etc. Although it has so far caused no serious damage to potatoes, it should be watched, and, if the circumstances warrant, all old stumps, etc., which harbour the insect should be removed. Another plan is to dig Vaporite into the soil, which is then pressed firmly down; the quantity of Vaporite used is generally at the rate of 225 lb. per acre for light soils, and about 350 lb. for heavy soils. Manurial insecticide worked into the soil has given good results.

SYMONS (T. B.) and CORY (E. N.). Miscellaneous Insect Pests.— Maryland Agric. Exper. Sta., College Park, Bull. 175, March 1913, pp. 171-179. [Received 31st Jan. 1914.]

A formula is given for a lime-sulphur spray against San José scale (Aspidiotus perniciosus), and for terrapin scale, (Lecanium nigrofas-catum), a standard miscible oil at a strength of 1:15, applied to the tree as late in the spring as possible, is recommended. The woolly apple aphis (Eriosoma lanigerum) is stated to be very common in apple

orchards, and of numerous remedies tried, 10 per cent. kerosel.emulsion seems to be the most effective against this and other aphids. The loss caused by Hessian Fly (Mageliola destructor) is periodic, but has increased during the last two years in Maryland. When wheat is infested in winter or early spring it is best to pasture sheep in the field. that they may eat the wheat down to the roots. As the insect passes the summer in the wheat stubble, this should be burned over or ploughed under as soon as possible after harvest. Rotation of crops is very beneficial. A list of cities and towns is given and dates before which wheat should not be sown in these places. In 1912, alfalfa, corn, millet, lawns and other crops or plants in their vicinity were seriously damaged by the fall army worm (Laphyqma frigiperda), The larvae can be controlled by the use of poisoned bait spread over the infested area. The pickle worm (Diaphania nitidalis) also caused considerable damage to cucumbers, melons, and early and late squashes and pumpkins in 1912. The moth deposits her eggs in the blossoms and the larvae enter the young fruits, where they live until mature. A trap crop, coming into blossom before the main crop, is a valuable method of collecting the eggs and larvae. All rubbish after the crop is taken should be burned. Widespread injury has been done to black locust trees, especially along the Potomac River, by the locust Hispid (Chalepus dorsalis). The larvae of this insect feed between the two surfaces of the leaf, where they also pupate. A poison spray of 4 lb. arsenate of lead to 50 gals, water was very effective, and the use of soap in the spray was found to make the solution adhere to the foliage better. Burning over the wood lots in late autumn may prove beneficial. The orange-striped oak worm (Anisota senatoria) has caused considerable defoliation of the pin-oaks, and severe injury in some nurseries. Two pounds of arsenate of lead to fifty gallons of water used as a spray will control the pest.

CORY (E. N.). The Peach-Tree Borer.—Maryland Agric. Expt. Sta.. College Park, Bull. 176, April 1913, pp. 181-218, 14 figs. [Received 31st Jan. 1914.];

The peach-tree borer (Sanninoidea exitiosa, Say) has been known to horticulturists for over 150 years. It has been found breeding in plumboth wild and cultivated, cherry, June berry, flowering almond nectarine, apricot, azalea, peach trees and shrubs. Wild cherry is probably the native food-plant. The author gives details of several breeding experiments, and notes that the greatest number of egg-deposited by one moth was 161, the greatest number in one place 17 and of all eggs deposited, 390 were on the leaves and 67 on the trunk. The larvae bore into the trunk, feed all the summer, usually in the cambium, and in the autumn work down below ground level. These entering the trunk higher up rarely reach maturity, possibly owing to extremes of temperature. The pupal stage lasts about 22–23 days. From the eggs the parasite, Telenomus quaintancei, Gir., was reared while a species of Bracon and of Macrodyctium have been bred from the pupae.

A table and explanatory notes are given showing numerous control measures tried and their results. The author states that, owing to the habits of oviposition of the moths, mechanical barriers cannot be

recommended; repellent washes that depend upon their odour for their effect are useless; coatings intended to present physical difficulties to the entrance of the larvae are ineffective; poison coatings are too readily washed off; and materials used at the base as repellents are ineffective and in some cases dangerous. Banking earth against the trunks to the height of six inches or more has proved the best practice that can be recommended, as the larvae are thus driven to enter at a higher point than normally would be the case. This facilitates the removal of the larva and reduces the cost. Extracting the larvae is certainly effective and when done carefully need not injure the trees. This should be done with a sharp knife and a light wire ending in a small hook; with this the larvae can often be drawn from the burrow. The trees should be "wormed" as late in the autumn as practicable and again in May. To facilitate the work the earth should be drawn away from the trunks to a depth of six inches and the root crowns a raped at least one day before the "worming" is begun. The paper concludes with a lengthy bibliography.

[DAVIS (J. J.). Common white-grubs. -U.S. Dept. Agric., Washington, Farmers' Bull. 543, 18th July 1913, 20 pp. 12 figs. [Received 5th Feb. 1914.]

The most serious outbreak of white grubs (Lachnosterna) recorded in the States occurred in 1912, when over 12 million dollars worth of damage was done, mostly in Iowa, Wisconsin, Illinois, Pennsylvania, New York, Connecticut and New Jersey. Available records show that May beetles were unusually abundant in 1908, the grubs causing considerable damage in Wisconsin, Illinois, etc. in 1909, and yet more # 1912. The beetles were very numerous in the spring of 1911, thus giving rather conclusive evidence that the life-cycle of the more abundant and numerous species in those localities is uniformly three wars. It is, therefore, reasonably certain that in 1914 the beetles sid again be unusually plentiful, and the year following (1915) the grabs will be exceedingly abundant and destructive if uncontrolled, either naturally or artificially. The grubs do the greatest amount of damage in their second year and to the early plantings in their third bear. From all observations small grains are less attacked than are corn timothy, strawberries and potatoes. It is important that the ambs of May beetles should not be confused with similar but nonsjurious grubs, or with others which may be injurious but require different methods of control. The grubs of May beetles are not known in breed in manure or refuse of any kind; those generally found in such places being the immature forms of certain brown beetles (Liggrus Albasas, de G., and L. relictus, Say) which frequent light in the same manner as the May beetle. The white grubs and May beetles are Proyed upon by numerous enemies, the most important being birds, the stomachs of 60 species of which the Biological Survey has found these insects. Crows and crow blackbirds are particularly useful, and th instance is given when one of the latter destroyed in all 20 grubs habout one or two minutes. The skunk is probably the most valuable of undomesticated mammals, so that farmers have begun to protect it. Of predaceous and parasitic insects the black digger wasp (Tiphia inornata, Say), another wasp (Elis sexcincta), and a fly (Pyrgota undata) appear the most beneficial. The knowledge of the several fungous and bacterial diseases reported as attacking the grubs and beetles is as yet superficial and their value for this purpose is still an open question. The author states that all general measures of control recommended are preventive rather than remedial, for once white grubs are present the crop cannot be protected from their ravages, But certain cultural and other practices will greatly minimise the damage in succeeding years. Domestic fowls should be given the run of infested fields, especially when the land is being ploughed. thoroughly clear an infested field if pastured on it any time between April and October. They are very fond of grubs and root to a depth of a foot or more in search of them; but in winter the grubs go much deeper and thus escape destruction. It should be noted that the giant thorn-headed worm, Echinorynchus gigas, an intestinal worm attacking swine, passes one of the early stages of its life within the white grub, which has been infested through the excrement of infested swine. In this connection Dr. S. A. Forbes says: "Pigs which have never been pastured are certain to be free from these parasites, and grabs growing in fields which have not been pastured by pigs are likewise certain to be free from them. The use of such pigs on such fields would consequently be without danger from this source, and a little attention to these facts will avoid any injurious consequences. That is, if pigs not previously allowed to run out are turned into fields on which pigs have not been pastured within three years, there will be no danger that they will become infested by these thorn-headed worms." During the years of great abundance of the beetles, hogs should be turned into orchards and timber lots during the period of flight and will eagerly seek them out, just beneath the surface of the soil or near trees where they pass the day. Autumn ploughing is very useful. Ordinarily the best time is between 1st and 15th October. as later on the grubs go too far down. The rotation of crops is also very useful, and since the eggs are usually deposited in fields of grass. timothy, and small grains it is evident that such crops as buckwheat. clover, alfalfa, and peas should be planted in the year following a season of beetle abundance. Collection of the beetles is effective where whole communities or neighbourhoods co-operate in the work. It is in the early morning, before 4.30 a.m., that the beetles are most easily shaken off the trees, and each female destroyed early in the season means the destruction of from 50 to 100 potential grubs. Where it is possible to secure cheap labour, collecting the grubs in the wake of the plough is practicable, especially where they are numerous. Light traps are not satisfactory as they attract hardly any female beetles. Spraving with Paris green or lead arsenate is effective, but usually impracticable owing to the large size of the trees upon which the beetles feed. With a more definite knowledge of the food-plants preferred, low-growing trees and shrubs might be planted as traps where the beetles could be sprayed.

No reliable remedy can be offered for the destruction of grubs in lawns: but poultry, especially turkeys, might be allowed to run on them. Hogs would tear up the roots. Perhaps removal of the sods collection of the grubs, and, later, autumn ploughing, will prove satisfactory. In cases of mild infestation a commercial fertiliser will probably assist the grass in overcoming the grub injury. Dealing

with Melolontha in Europe, Decoppet injected carbon bisulphide into the soil at a depth not exceeding six inches, at the rate of 1 to 1½ cances in 6 or 8 holes per square yard, and this has been found to diminish the number of grubs considerably. Excellent results are diminish the humber of grubs considerably. Excellent results are diminish the humber of grubs considerably. Excellent green June beetle in the lawns of the Southern States, and it is probable that this method will prove successful with the white grub in lawns. The holes should be plugged with soil or sod to prevent the fumes escaping and at must be remembered that carbon bisulphide is highly inflammable and forms an explosive compound when mixed with air.

GASTINE (G.). Diaspis pentagona (Cochenille du Murier). [The mulherry scale.] Librairie agricole de la Maison Rustique, Paris, N.D., 45 pp., 9 figs; price 30 centimes.

This is one of a series of popular booklets, each treating of a single subject and written by a specialist. The author points out that the scale-insects and aphids may be considered the most dangerous agricultural pests known, and as through the agency of its agile larvae Diaspis pentagona spreads quickly afar, the greatest energy must be employed against it. In its country of origin, the Japanese regard this scale as the worst enemy of the mulberry and other fruit trees, and its rapid dispersal throughout the world is due to shipments of adested plants on which the insect defies the most unfavourable conditions; for it can survive extreme cold and even dessicated fragments of a twig suffice for its subsistence. The author suggests that the destruction by fire of any infested plants imported into a clean country is the only safe measure. Should this be impracticable, scrubbing with wire brushes followed by the burning of all the débris and the thorough application of an insecticide is the best method, the solution being sprayed on the branches and brushed into the bark of the trunk and larger branches. The latest formulae officially advised in Italy are: (1) A. heavy coal-tar oil 22 oz., crude oil of turpentine 24 oz., B. common sea-salt 22 oz., wheat flour 4 oz., water 2 gallons; (2) A. crude petroleum 22 oz., ordinary fish oil 21 oz., crude oil of turpentine 11 oz., B. common salt 22 oz., wheat flour 1 oz., water 2 gallons: (3) A. mixture of mineral oils (density 1:05), called Eusol in Italy, 22 oz., B. common salt 3 oz., wheat flour 1 oz., water 2 gallons. To prepare any of these the salt is dissolved in the water and the flour mixed in. The oily mixture A, already prepared, is gradually added with very energetic stirring in order to obtain a homogeneous solution. As the component parts tend to separate very readily the author suggests the use of Saponin, which produces permanent emulsions easily. Saponin is not obtainable commercially, but many vegetable products contain this substance, the fruit of Sapindus utilis being richest in it. Saponin represents about 50 per cent, of the pericarp, which itself is about 681 per cent, of the total fruit, and as it dissolves out in water the pericarp may be conveniently employed for the purpose. The author gives four formulae: (1) A., heavy coal-tar oil 2 lb., B. saponin solution obtained by extracting I oz. of Sapindus pericarp in 2 gals. of water: (2) petroleum oil or crude petroleum 2 lb., B. saponin solution as above: (3) homogeneous emulsion -A., clear heavy coal-tar od (density 1045) 20 oz., medium coal-tar oil (density 950) 124 oz.,

B. saponin solution as above: (4) homogeneous emulsion. A. clear heavy coal-tar oil (density 1045) 284 oz., petroleum (density 800, 41 oz; B. saponin solution as above. To prepare solution B. Sapindus pericarp (1 oz.) is boiled for a few minutes in water (1 pint taken from the 2 gallons) and when sufficiently soft it is mashed to facilitate solution of the saponin. This preparation is passed through a No. 65 (French) sieve, as the insoluble particles would clog the sprayer. To extract all the saponin this insoluble residue is placed in the remaining 15 pints of water and again strained out. Into the saponin solution (B) the oily mixture (A) is gradually poured with energetic mixing, when the fine oil globules will remain in suspension. [Cf. this Review, A. i. p. 238.] If the oily mixture is heavier than the water it will sink, if lighter, it will float, but the slightest shake will cause uniform admixture; with equal densities the englision is permanently homogeneous. The author points our that though his formulae are stronger than the Italian ones, ye owing to the perfect emulsification the shoots are in less danger of being harmed. All the foregoing sprays are for winter use, Should it be desirable to follow up the treatment by spring and summer applications, the percentage of the coal-tar and petroleum oils must be reduced to 15 per cent, or 2 per cent, at the most, as otherwise damage will be done. Either the saponin solution may be used, or 11 oz, of white soap dissolved in the 2 gals, of water when the latter is at boiling point; soft snap contains too many impurities. The insecticide is used as a spray and the first application made when the young larvae appear, is followed by a second at 10 days' interval. The men must be protected by gloves and masks with glazed eye-holes.

The author mentions Prospillella berlesei, a small Chalcid fly now being tested in many parts of Italy and which Berlese hopes will check D. pentagona. Other parasites are being studied in Italy, especially by Silvestri. But at the present time direct methods of control are the only ones in real use. The author concludes by giving a list of some 50 different trees and plants affected by the pest and remarks that this list can be added to daily.

HENRICH (C.). Die Blattläuse Aphiden der Umgebung von Hermannstadt. [Aphid plant lice in the neighbourhood of Hermannstadt.] Verh, and Mitt. Siebenbürgischen Ver. Naturwiss, zu Hermannstadt., ställ, 1xiii, no. 6, 1913, pp. 195-2)1.

The present paper forms a supplement to one published by the author on Aphids in 1909. Since then some additional species have been discovered by him in the environs of Hermanustadt, amoust which are: Mindarus abietinus, Koch, on Abies pertinuta: Pemphine prifformis, Licht., P. barsarius, L., P. barealis, Tullgren, and P. Labtensteini, Tullgren, all on Populus paramidalis and P. nigra: and Phyllogera acanthocherms, Lichtst., on oak.

Sutze (K.). Zur Kenntnis einiger Psylla Arten aus dem Ungarischen National Museum in Budapest. [On some species of Psylla from the Hungarian National Museum.] Ann. Mus. Nat. Hangure. Budapest, xi., pt. 2, 1913, pp. 409-435.

Seven species of the genus Psylla are described from specimens in 3

collection from the Hungarian National Museum. Two species are new, namely P, groenlandica and P, horeathi the former from Greenland and the latter from Hungary; their life-history and habits are as we miknown. The species P, herastigma, Horvath, is of economic interest, as it attacks the leaves and fruit of the pear; its larva is againown. It occurs in Eastern Siberia and Japan.

Sur l'emploi des arsenicaux en agriculture. [The use of arsenicals in agriculture]. Bull. Agric. de l'Algèric et de la Tunisie. Algiers, xix, no. 19, 1st Oct. 1913, pp. 378-380.

The Commission des Substances cénéncoses has handed to the Académie de Médecine. Paris, their new report on a long delayed regulation to modify that of 1846 regarding the use of poisons. Part of the report deals with arsenicals used in agriculture. Subject to safegrards the Académie authorised, in 1910, the use of the potent but Augerous arsenical insecticides, with the exception of lead arsenate, which had just begun to be employed. Its use is now general, as a consequence of its very valuable properties, and it was necessary to decide whether to prohibit it, or to permit it under specified rules. The report recommends the latter course, pointing out that the U.S. Muister of Agriculture specially advises lead arsenate in preference to other insecticides, so that the French markets will be flooded with toreign produce if the French agriculturist is not provided with weapons qual to those of his rivals. Regarding the sale and use of arsenicals, especially lead arsenate, the Report expresses the following desiderata

(1) That the regulations be strictly observed: (2) that the Ministerial decrees determining the precautions to be taken by users of the products and the conditions under which they may be used, be clearly and minutely detailed, billed everywhere, and brought to public notice, and any infringement severely jumished: all this to be especially applicable to lead arsenate; (3) that the Government initiate and encourage research, with the object of replacing such dangerous insections by methods harmless to man and domestic animals.

In order to prevent food-plants being wetted by drippings from trees and vines above them, the Commission propose to introduce a clause formally prohibiting the use of arsenicals for other insecticides of Table A of the regulations) for market-gardens and folder plants.

Chos (A.). La Mouche de l'Olivier, [The Olive Fly.] Bull. Agric. de l'Algérie et de la Tunisie, Algiers, xix, no. 22, 15th Nov. 1913, pp. 467-468.

Early in 1913 the author drew attention to the enormous proportion of objects in the neighbourhood of Mascara (Oran, Algeria) attacked by but as object and the presence at the same time of a small lehneumonid. He made a special study of both insects on a completely isolated olive the which was not treated in any way against the pest in 1912. In that year not a single sound olive was obtained, but in September 1913, though the tree bore well, there was no sign whatever of attack by the fiv. He attributes this to the activity of the parasite, and semarks that had the tree been sprayed, the good results would have been attributed to the spray and not to the parasite. The author is sof altogether satisfied that spraying per se is entitled to the great centril thas obtained.

MACGILLIVEAY (A. D.). The Immature Stages of the Tenthredinoidea. Canadian Entomologist. xlv, no. 11, Nov. 1913, pp. 367-371.

A general account of the larval habits of the various families of sawfiles.

MACKIE (D. B.). The Philippine Locust (Pachytylus [Locusta] migratoriales, R. & F.): Natural Influences affecting its Propagation and Distribution. Philippine Agric. Review, Manila, vi. no. 11, 1913, pp. 538-547, 2 pls.

The chief forces which operate for or against any species may is stated as climate, food supply and enemies. Climatic influences ever the greatest cheek on locusts. Cold weather causes them to hibernate for extended periods, though this is seldom the case in the Philippines. Winds are important in locust distribution and control. winds often enable swarms to make long, sustained flights, eyecrossing from island to island, as from Cebu to Negros. High winds tend to keep locusts near the ground and to prevent extended flight. and severe winds often work great havor with locust swarms, at timecompletely annihilating them. Locusts seldom fly during rams, The results of a typhoon are often disastrous to the swarm, the locusts being killed in large numbers by the vegetation being whipped about by the high winds, while the wings of the adults are often torn to see an extent that further flight is impossible, so that the females are forced to lay their eggs on unsuitable ground, which results in a low percentage of them batching. Floods are important as locust destroyers especially when large areas on which locusts have ovinosited become flooded and quantities of silt deposited over the eggs which effectually prevents the hoppers from emerging. Drought seems to exert a powerful influence in the increase of the pest, since dry weather is immical to locust parasites. Drought may also induce migrations. Lack of food might also cause the migratory instinct to assert itself Locust enemies may be classed as predators, parasites and diseases The importance of birds as locust exterminators cannot be too strongly emphasised; and numerous mammals, reptiles, frogs, etc. and predators insects attack almost entirely the immature insects and eggs. Of the thes present in the Philippines, the Dexinae have never been bres out, but have been noted in the vicinity of swarms. The SARCO-PHAGINAE are known to parasitise both the mature and young locusts Two species of Nematodes, or hair-worms, representing the two geneta-Gordins and Mermis have been found in the Philippine locusts, the former breeding in water, while the latter is terrestrial. The eggs are deposited in water or on the ground and the young crawl up the vegtation, reaching the host through the mouth with food, and undergontransformation in the body cavity of the locust. These parasite are probably of little economic importance as locust destroyers. The red locust unites, so far as is known, are no great inconvenience to their hosts. The possibility of controlling locusts through the agency of parasites is very remote since the percentage of parasitised individuals is small. The fungous disease due to Empusa grylli has been known to infect locusts, but it is impossible to cultivate this fungus with much success artificially and communicate it to locust swarms Experiments to test the effect of Coccobacillus accidiorum. D'Herelic

were made, and cultures brought to their maximum virulence in the laboratory were introduced on a swarm of half-grown locusts. The results were practically nil and the contagion did not spread.

Stand der Reblausbekämpfung im Jahre 1912 in den Kantonen Zürich und Thurgau. [Phylloxera control in the cantons of Zürich and Thurgau in 1912.] Schweiz, Zeits, Obst- und Weinban, Frauenfeld, no. 22, 24th Nov. 1913, pp. 349-350.

In 26 communes 4.781 infected stocks were noticed in 247 new points. Five permits were granted to replant previously infected areas with 745 native stocks and two permits for 443 were refused. Twenty-five proprietors renounced re-planting on payment of a lump sum. Replanting with grafts on American stocks is allowed after an interval of at least four years, or eight years in the case of native stocks. As a trial, nurseries for grafted vines were established at Steinmaur and Delsdorf. In the latter place two new experimental plots were planted with grafted vines. This brings the number of Zürich plots up to 26. all in an average good condition, and the material for these was supplied by the Swiss Experiment Station at Wädenswil. In spite of the vine tax, the vine fund has fallen from £5,218 to £5,055. From 1886 to 1912, 731,895 stocks on an area of about 125,000 acres were destroyed in the Canton of Zürich, and the costs were as follows: Wages, 131 189; Chemicals, £6,563; compensation, £33,971; other expenses, (10.522. The total cost was £82,246. A portion of the cleared land has again been planted with vines, partly as experimental plots with grafted stocks, and partly with native stocks.

The Canton of Thurgau report mentions 333 infected stocks at 59 points. Proprietors were paid £71 compensation for the destruction of 2.591 stocks on an area of half an acre. In 1912, no infection was noticed in the communes of Landschlacht, Gachnang, Aadorf and Altnau. The campaign was begun in 1897 and up to 1912 a total of 419.844 stocks had been destroyed and the proprietors paid £1,574 for the grapes and £5,274 for the stocks. The report does not give any other figures. Five experimental plots of grafted vines have been planted in the former Phylloxera centres.

J. D. Zum diesjährigen Mottenflug. [The vine-moth flight in 1913.]— Luxemburger Weinztng., Grevenmacher, i, no. 30, 15 Nov. 1913, pp. 517-518.

Experiments lasting from 10th July to 30th August were conducted by Herr Fixmer of Grevenmacher, who found that the flight took place from 18th July to 29th August, thus occupying no less than 43 days. Four beer-traps were used. A total of 1,393 moths were captured, or 315 per trap. According to these figures the system of trapping is a profitable one. The largest number taken was 112, on the 28th July. The great variation in the numbers caught daily does not allow of a useful average being struck and cannot be accounted for. It is hoped that next time the figures will be completed by notes on the weather conditions prevailing. Such experiments are a valuable aid in determining the proper time for beginning control measures.

KRANZLING. Acheta morio, ein Sisalschädling. [Acheta morio as a Sisal pest.] Der Pflanzer, Dar-es-Salaam, ix, no. 11. Nov. 1913, pp. 568-570.

In inspecting a new Sisal plantation it was seen that a number of healthy one-year-old plants were injured in a peculiar manner not previously observed. At their junction with the stem - and some times on their spread the lowest leaves were eaten into holes about as large as the thumb-nail. Some leaves had been entirely detached while others hung suspended by a few strips. The injury was done by night, and only occurred on those plants growing on ground with a cracked and broken surface. A night-visit to the fields showed the post to be a cricket, Acheta morio. Only young specimens, measuring from 1 cm. to 15 cm. in length, were noticed at work, as the older ones escaped on the least alarm. The largest caught measured about 3 cm. Cotton, which was planted in between the sisal, had not been touched This is only the second insect which has been observed to attack sisal. The author remarks that this occurrence of the insect was quite local and simply due to the favourable conditions provided by the broken soil. In case the pest spreads and causes further damage control will be necessary, but it should be neither difficult nor costly.

BOUVIER (E. L.). Coccinelles contre Cochenilles. [Coccinellids to combat Coccids.] Revue Scientifique, Paris, 29th Nov. 1913, pp. 673-677.

The author gives in outline an account of the work done by Riley in combating the Coccid, Icerya purchasi, in California by means of the ladybird, Novius cardinalis, and of the more recent work carried out on the same lines in Italy by Silvestri and Berlese, who have reared parasites of the Coccid. Diaspis pentagona. Of several parasites reared, the two most effective seem to be Prospatella berleser, bred by Berlese, and Rhizohius lophantae, reared by Silvestri. The two entomologists are not agreed as to which of these will prove of most use in combating Diaspis. Without entering into the discussion of this question, the author records that twigs of mulberry infested with Diaspis, which was itself attacked by Prospattella, were submitted to him, and that he found the degree of parasitism to be very high, a fact which speaks in favour of the efficacy of Prospattella. In Nice and eastward to Vintimiglia mulberry trees are attacked by Diaspis Artificial methods of control are held by the author to be only of temporary use, and he thinks that to keep the pest really under control there is no better way than to introduce its natural enemies.

Gurney (W. B.). Ironbark Foliage destroyed by Insects,—Agra Gaz, N.S.W., Sydney, xxiv, pt. 12, Dec. 1913, p. 1076.

Ironbark leaves in Strond were found to be affected by "Lerp" Insects (PSYLLIDAE), which attack also Eucalyptus trees, sucking the sap. They construct shell-like coverings called "Lerps," under which they grow: after several moults they appear as minute four-winged insects, which lay their eggs on the leaves, on which fresh broods soon batch. When plentiful they destroy the bulk of the foliage, but usually they are prevalent in numbers which only cause temporary damage. They are kept in check by their natural parasites, minute Chalcid wasps.

Roles (P. H.) and Fawcett (H. S.). Fungus Diseases of Scale-J Insects and Whitefly. -Florida Univ. Agric. Expt. Sta., Gainesville, Ball. No. 119, Nov. 1913, pp. 71-82, 20 figs.

In Florida, fungus diseases have been employed to a very large extent to combat insect pests, for owing to an abundant rainfall and moist atmosphere, the climate is especially favourable to the development of such fungi. These diseases of scale-insects and whitefly are Lative to Florida, the fungi appearing spontaneously in widely separated orchards. The fungi do not attack trees, and having destroyed the scale-insects or other pests, perish. Careful observation is required in order to find out where the insects are most numerous and to introduce the fungi in the best positions. For small and badly infested trees spraying with some contact insecticide is recommended to relieve the condition temporarily. The fungi may be bought from F. P. Henderson, Gainesville, Fla.; F. Stirling, De Land, Fla.; S. L. Story. Eutis, Fla., the cost in general being from one to three dollars per acre of trees to be treated. Among the fungi-producing diseases, the red-headed fungus (Sphaerostilbe coccophila, Tul.) is known to affect a large number of scale-insects. The method of applying the fungus is to tie a piece of fungus-bearing material on a portion of the tree most severely attacked. A dozen pieces or more should be used m every tree according to the degree of infection, and the fungus placed so that it is shaded from the direct rays of the sun. This fungus has been successfully applied by the spore-spraying method. One or two hundred pustules, each of which contain thousands of spores, to the gallon of water would seem efficient for spraying. The whiteheaded fungus (Ophionectria coccicola, E. and E.) seems more effective m citrus orchards in checking the long scale and the purple scale than does the red-headed fungus. The method of application is the same as for the red-headed fungus. Occurring in all parts of the State and having a very general distribution in Florida is the black fungus (Myriangium duriaei, Mont.) especially useful in destroying the chaffscale (Parlatoria pergandii). Here again a small sprig with the fungus should be tied to the scale-infested portion of the tree. This fungus is slow in killing the scales but the eradication is generally perfect. The red fungus (Aschersonia aleurodis) of the white fly has been applied with great success by the spore-spraying method. From 25 to 50 leaves, having an abundance of pustules on them, are allowed to soak from five to ten minutes in a pail of water, being stirred occasionally. The mixture is strained and applied to the under sides of the leaves. The vellow fungus (Aschersonia flavocitrina) of the whitefly is useful only in combating Aleurodes nubifera and is applied by spraying; but the brown fungus (Aegerita webberi, Fawcett) of the whitefly has been employed with extremely satisfactory results. The cinnamon fungus Verticillium heterocladum) is not very important as a check to scale-

Watson (J. R.). Preserving Fungus Parasites of Whitefly. -Florida Univ. Agric. Expt. Sta., Gainesville, Press Bull. No. 217, 29th Nov. 1913, 1 p.

Citrus-growers should be supplied with plenty of red and brown parasitic fungi at the beginning of the rainy season in June, when,

however, fungus material is often scarce. When plentiful, as in November, the grower should lay in a supply for use in the next summer. For this purpose a quantity of leaves are collected, allowed to dry for a day or two, and then put in a tight tin box which is to be kept in a cold storage room where the temperature is usually below 40° F., or in a refrigerator. In some circumstances this fungus material may be dried and kept in a dry condition without losing its power to germinate. In the Experiment Station leaves of red fungus were collected in December, allowed to dry, piled loosely in an open box and kept till July. They were then used to spray the trees and the results were as good as those from spraying with material kept in cold storage.

HOOD (J. D.). On a Collection of Thysanoptera from Porto Rico. Insecutor Inscitiae Menstruus, Washington, i, no. 12, Dec. 1913. pp. 149-154, 1 pl.

The collection of Thysanoptera reported upon by the author contained seven species; it was made by the late Dr. C. W. Hooker in the immediate neighbourhood of Mayagüez, Porto Rico. Six of the species described are recorded for the first time from the island; one species is new and a new genus has been made for it, namely, Dinurothrips hookeri. The following species were taken on cultivated plants:—Heliothrips haemorrhoidalis on cacao, Frankliniella tritici on orangeblossom, Selenothrips rubrocinctus on cacao and Gynaikothrips uzeli on tobacco.

Melle (H. A.). Lucerne (Medicago sativa.)—Agric. Journ. Unio. S. Africa, Pretoria, vi, no. 6, Dec. 1913, pp. 950-960.

In this paper the author gives the history of this plant from the seed-bed to the market. He notes that one of the great enemies of lucerne at Vryburg is the lucerne caterpillar (Colias electra). The perfect insect is a yellow butterfly, the larva being a smooth green caterpillar that feeds ravenously on lucerne and will play havoe with a crop. Lounsbury recommends for the eradication of this pest the cutting of the lucerne when the damage threatens to be great. If lucerne is under irrigation a good method is to flood it continuously by which means the "caterpillar wilt disease" will be induced amongst the larvae.

Guénaux (G.). Les Maladies des Chrysanthèmes. [Diseases of Chrysanthemums.]—La Vie Agricole et Rurale, Paris, ii, no. 51 22nd Nov. 1913, p. 667.

A fly, Phytomyza geniculata, lays its eggs in the leaves, the larvar forming mines in the parenchyma. The attacked leaves should be picked off and burned, and the plants treated with a 1 per cent, solution of tobacco juice: they should be sprayed every fortnight subsequently with a 5 per cent, solution. The male of Calocoris chenopodii, and Hemipteron, sucks the buds, and the female lays her eggs in the young leaf-and flower-buds. The treatment recommended is spraying with 1 per cent, solutions of tobacco juice, followed by applications of sulphur to the young shoots and buds. Repeat these operations every

fortnight from May to September. Aphrophora alni, a froghopper, s very common in summer and lays its eggs in large numbers on the ereen parts and sometimes on the flowers. The larvae suck the juices of the leaves. This pest is treated in the same way as Calocoris A. mapsdii, but operations ought to be commenced in March. The caterpillars of Grapholita minutana eat the collar of the young chrysanthenums and the young shoots, and bore into the flower-buds; the treatment is the same as for C. chenopodii. Any flower-buds found to be occupied and deformed by a larva should be picked off and burned.

CHREEN (T.). Studien über den Vogelschutz im Jahre 1913. [Bird protection in 1913.]--Aquila, Budapest, xx, 1913, pp. 476-502, 6 figs.

The author suggests the pruning of those hedges in which it is wished to shelter birds that only feel safe in bushes where thick cover extends right down to the ground. Instead of pruning so as to obtain a square top and vertical sides, the base of the hedge should be wider than the top so as to allow plenty of light to reach the leaves closest to the ground and promote their growth.

To prevent cats from reaching bird-boxes placed on tree-trunks, barbed wire is wound in a spiral five or six times round the trunk beneath the box. In order that the wire may stand off the trunk it is nailed on small wood blocks about 2 inches thick and the nail driven through such a block can only penetrate the bark and does not do any great harm to the tree.

It is pointed out that bird protection costs very much less than collecting caterpillars, and in spite of most careful collecting the trees are often stripped. In Hungary the aid of the schoolmasters is enlisted in order that the children may learn to understand the asefulness of birds in the economy of agriculture.

ROHWER (S. A.). Descriptions of New Parasitic Hymenoptera. -Proc. Entom. Soc., Washington, xv, Dec. 1913, pp. 180-188, 1 fig.

Seven new species of parasitic Hymenoptera belonging to the families lchneumonidae and Braconidae are described so that names will be available for species which have proved of economic importance in helping in the control of injurious insects.

CESHMAN (R. A.). Biological Notes on a few rare or little known Parasitic Hymenoptera.—Proc. Entom. Soc., Washington, xv, no. 4, Dec. 1913, pp. 153-160, 2 figs.

Perditus americanus, Riley, a Braconid parasite of lady-birds was very abundant in Vienna, Virginia, in the autumn of 1912; but a hough a number of other species of Coccinellinae were present, home but the species Megilla maculata and single specimens of Hyppulamia convergens were parasitised by P. americanus. In experiments in the laboratory an adult female Perilitus was given access to various species of Coccinellids, including Adalia bipunctata, Andis 15 punctata, Hippodamia glacialis, H. convergens, Coccinella Probata. Megilla maculata, Cycloneda sanquinea (-munda), and Hapemspis sp., as well as a number of undetermined larvae. All

these were found to be parasitised except Hyperaspis sp. The larvae were attacked at any point, while the adults seemed to be attacked only between the segments. The parasite, before ovipositing, perceives the presence of the beetles from a distance of at least an inch, when she shows great excitement by rapid vibration of the antennae and quick movement towards the beetle, then rushing in and giving a quick thrust with her ovipositor. It is probable that the parasite hibernates as a larva within the host.

Paniscus geminatus, Say, was found as an external parasite on an undetermined Lepidopterous larva found under a band on an apple tree.

The Chalcid, Sphaeropyr bicolor, Cress., was frequently taken in immature stages as a parasite of Acronycta clarescens, Guen. This parasite is gregarious, as many as 30 having been reared from a single host. The total period from the emergence of the larva from the host to the issue of the adult is 20-21 days. From some hosts only males were reared, and from others only females, but from the majority parasites of both sexes emerged, the males issuing one or two days ahead of the females. From 22 hosts there were reared 296 females and 86 males. The parasite hibernates as a larva within its cocoon: frequently it is attacked in the cocoon by an omnivorous hyperparasite, Dibrachys boucheanus, Ratz., but it is seldom that all the cocoons in a mass are parasitised. Some eggs of two species of Aeronycla, one of which feeds on wild cherry, and the other on pear, were exposed to S. bicolor; while the parasites took no notice of the eggs, they showed great excitement when on leaves bearing eggs, running rapidly about, dragging their ovipositors over the surface of the leaf and searching minutely with their antennae. No such excitement was shown when uninfested leaves were supplied, a fact suggesting that the search for hosts may possibly be guided somewhat by the scent left by the parent moth on the leaves on which she oviposits. A few days later the Acronycta eggs hatched, and the larvae were exposed to the parasites, and were immediately attacked. Older larvae were never touched.

BUSCK (A.). Note on a Bark-mining Lepidopteron of the genus Marmara, Clemens.—Proc. Entom. Soc., Washington, xv, no. 4, Dec. 1913, pp. 150-151.

In the course of work on forest Lepidoptera the author has bred several specimens of Marmara fulgidella, Clemens, from oak. The larva of this insect forms long winding galleries just under the epiderms of young trunks and branches of oak, and leaves the mine early in the spring to spin a small cocoon in some crack in the bark. Similar Marmara mines were found less commonly on chestnut; the image was not secured, but it is thought that it may prove to be the same species or one of the allied forms, fascilla, Chmb., or elotella, Busck at present listed under the genus Gracilaria.

KNOWLES (C. H.). A Report on Scale-Insects found on Bananas in Taviuni. -Dept. Agric. Fiji. Sava. Pamphlet no. 1, 18th July 1913, 3 pp. [Received 19th Feb. 1914.]

As a result of a visit to Tayiuni to inquire into the outbreak of scaleinsects on bananas in that island the author reports that he caneseries no examples of the transparent coconut scale, Aspidiotus Legistor, but that at least five species of scale-insects were observed , bananas, two of which were also found on coconuts. Most of the commutestates have bananas growing for food purposes, but the author ... isiders that the cultivation of bananas on Tayiuni and particularly aroug coconuts is attended with very serious risk to the coconut abstry. It is stated that plantations of bananas at intervals along the coast provide an extensive area in which the transparent cocomit and might become established, should it ever be introduced into the Land, and the present growers should be arged to discontinue the editivation of bananas. A bunch of bananas infected very plentifully a.th. A. destructor was noticed on board ship at Levuka, and the atten-*gon of the agent has since been called to the matter and he has promised to give instructions regarding such scaly fruit. The conditions under which bananas are grown are more favourable to the tapid spread of scale-insects than is the case with coconuts. The outbreak of scale in Tayiuni and the possibility of the introduction of the transparent scale there, are strong arguments in favour of the early introduction of regulations for compulsory spraying of bananas and for controlling the transport of fruit or plants from areas in which the scale is plentiful. A. destructor, which is common on bananas on Vitilevu, is a serious cocunut pest in some places, and a menace to the coconut industry, and every effort should be made to eradicate the insect or at any rate to check its spread, particularly to coconut areas. Specimens of all the scales are being sent to England for identification.

Lewron-Brain (L.). Agriculture in Malaya in 1912. Dept. Agric. Fed. Malay States, Knala Lumpur, Bull. no. 18, Oct. 1913, pp. 1-45, 7 tables.

In an account of agriculture in general in Malava during the year 1912, reference is made to the insect pests of the various cultivated plants. Of the pests of rubber it is stated that on the whole no great damage was done, and that the rubber tree, Herea braziliensis, is generally only attacked by insects when it is weakened by bad treatment or fungus. A mealy-bug was found attacking rubber in Perak, but when the estate was visited, lady-birds and lepidopterous larvae were found preving on the scale, and as no further damage has been reported, it is hoped that the pest is being held in check. Of termites, Terms gestroi was controlled by means of the "Universal White Aut Destrover," which was also used with good results on colonies of I curbonarius and T. sulphurens, termites that sometimes damage towly planted stumps. Against Xylotrupes, the fork-horned rhinoteros beetle, and Brachytrypes, the large cricket, the Carev system of truncated paper cones was found to be effective. Xyleborus sp., a small shot-hole borer, was found attacking full grown trees, but usually only where they had been weakened by too close planting or bad pruning. It is recommended that the system of lopping branches overhanging roads and railways be improved; the cuts should be clean, and made as near the trunk as possible; the cut surface should he tarred. Those estates which leave long stumps with hacked ends are sure to become sources of infection to their neighbours. No cases of healthy trees being attacked by the borer have been recorded. Plant mites have caused some loss in rubber nurseries, but against these the lime-sulphur spray is usually effective.

Coconuts suffered very little from pests, no serious outbreaks being recorded. The caterpillars of Brachartona catoxantha attacked the coconut plantations in the vicinity of Batu Gajah; to prevent the spread of these insects the Inspector of Coconuts had the trees for a time almost completely defoliated and the leaves burnt, leaving only those standing that were not affected. As some of the owners objected. and the Coconut Enactment does not contain provision for dealing with this pest, the process had to be arrested, giving the insect the chance of spreading to neighbouring holdings, which it soon did, At the close of the year the Inspector reported that the drastic treatment adopted at first was entirely successful, and that the foliage on the treated trees was exceptionally good, while 20 per cent. of them were again bearing. The untreated trees, he states, were far inferior in appearance. The final checking of the spread of the pest was accomplished by a parasitic Ichneumonid, which was found present in large numbers at the height of the outbreak. A number of trees were defoliated by two pests, the coconut skipper (Hidari irava) and the coconut bag-worm (a Psychid): both of these insects are subject to the attack of Ichneumons. A small Hispid beetle was received from Johore; it is a serious pest of coconuts in the Philippines.

During the year one area of about 200 acres of young coconuts was defoliated by locusts (Locusta dunica, L.) on an estate in Negri Sembilan. The trees at the close of the year practically all showed signs of recovery. The locust first appeared prominently early in the year on grass-land near the West Coast of Negri Sembilan, whence it spread in the flying stage to Seremban and there started breeding. As a rule the insects were quite contented to feed on the lalang grass, and it was only where this had been cleaned up that they took to other plants, such as bamboo, Indian corn, sugar-cane, etc. Experiments are being carried out with a view to finding out the best methods of combating the pest, even although it is at present doing but little damage to any valuable crops.

PARROTT (P. J.) and HODGKISS (H. E.). The False Tarnished Plant-Bug as a Pear Pest. New York Agric, Expt. Sta., Geneva, N.Y., Bull. no. 368, Nov. 1913, pp. 363-384, 11 figs., 8 pls. [Received 14th Feb. 1914.]

During some seasons, pears in different orchards in New York are much distigured with rough and hard corky spots and are liable to be considerably deformed. In 1908, when the injuries were very severe investigation was commenced to ascertain the identity of the offender and to develop a satisfactory method of control. In the spring of 1909 careful watch was maintained on a number of orchards and it was found that the flowing of sap from young fruits was due to a number of green hemipterous nymphs. From these nymphs adults were obtained and identified as Lygns invitus, Say. The fruit damaged by these insects later became covered with hard corky spots. This bug has also been reported on wild grape blossoms, occasionally on the tender leaves of wild apples which have been intertwined with the wild grapes, on the common soft maple (Acer saccharinum, L.). on

reaches, and on the young leaves of the sumach (Rhus canadensis, Marsh). In its attack on pears, L. invitus shows a preference at first her the tender leaves, puncturing those that are unrolled; the tissues about the point of injury turn black. Later the young nymph thrusts ts proboscis deeply into the substance of the tiny pear and on withdrawing it sap flows from the puncture, drying and leaving a blackish spot. There may be many wounds, and severely injured fruit, besides being hadly deformed, may be stunted in its growth. None of the backing varieties of pears seem exempt from injury. When attacking Hossom-clusters the young nymphs pierce the bases of the unopened hads and the tender fruit stems. The insect's work on peaches has been observed under natural conditions, but in confinement grouphs of the third and succeeding instars and adults readily attacked the truit. Illustrated descriptions of the life stages are given. The gymph passes through five stages, attaining wings at the fifth ecdysis. The larvae begin to make their appearance when the trees are coming nto idossom. The adults feed for a short time after emergence, when they disappear.

As a protection to the crops, spraying, just after the blossoming period, is recommended. In the Station spraying tests, tobacco extrict (10 per cent, nicotin) "Black Leaf 40," ³/₄ pint of the extract to 100 gals, of water, to which is added 3 lb, of soap, has given the most satisfactory results. The trees should be drenched and both surfaces of the leaves wetted. The removal of wild food-plants is a valuable precautionary measure, the insects being found in largest tounders on wild grapes and to a much less extent on sumach, both common and widely distributed weeds.

Associated with *L. invitus* have been found *Lygidea mendax*, Reut., abandant on pears, plums and apples; *Campylomma verbasci*, Meyer, attacking pear foliage and fruit in a manner quite similar to that of *L. ipvitus*; *Paracalocoris colon*, Say, found on Bartlett pears; and *P. scripeas*. Say, commonly associated with *L. invitus* on wild grape, beging on the tender leaves and blossom-clusters.

J. W. Polychrosis botrana oder der bekreuzte Traubenwickler in unseren Weinbergen. [The Crossed Vine-moth in our Vineyards.]—Luxemberger Weintzg., Grevenmucher, i, no. 31, 1st. Dec. 1913, pp. 529-531.

Four Polychrosis botrana moths were found among the thousands of the state ambiguella captured in the 100 vine-moth traps set in 1911. In view of this very small percentage no action was taken at the time, but in the meanwhile P. botrana has increased. Among 200 moths exist in 10 traps on the 25th July 1913, ten were P. botrana. No tarther specimens were found in ten other traps set higher up in the same vineyard. Vine-growers must adopt immediate measures to combat this new pest, for even if some observers (Capus, Feytaud, Dafourl are right in stating that where P. botrana increases the other leader decreases to almost vanishing point, this only means exchanging abad enemy for a worse.

NOTICE (A. M. G.). Parasite Introduction to Maine.—Qurly, Bull. Maine Dept. Agric., Augusta, xii, no. 4, Dec. 1913, pp. 10-18, 6 pls.

The first importations into Maine of insect parasites of the gipsy and

brown-tail moths were begun in 1905. The results have been so encouraging that, after eight years' experience of mechanical control it was considered advisable to attempt the colonisation of parasites to supplement the hand-work in Maine, and last March a laboratory for breeding parasites and observing their work was established in Portland. The work of breeding and liberating thus far has been with Apanteles lacteicolor and Meteoras versicolor, as enemies of the brown-tail moth, Compsilara concinuata, parasitic on both the gipsy and brown tail moths, and the Calosoma sycophanta beetle, also predatory on both invests.

A. lacteicolor is a very small hymenopterous fly, native to most European countries that are infested with the brown-tail moths. These Braconids deposit their eggs under the skin of the newly-hatched caterpillars. In Maine, brown-tail webs, collected in localities known to be infested with Aparticles and Meleorus, were brought to the Maine laboratory, and placed in feeding trays. As soon as a sufficient number of cocoons of the parasites were obtained from the infested caterpillars, they were carried into the field for colonisation as quickly as possible before the adult had emerged. The cocoons were placed in a waterproof box, nailed to the tree, both tree and box being smeared with tanglefoot to prevent destruction of the cocoons by ants, and here left to emerge. In this way about 15,000 cocoons have been distributed. A sufficient number of Meleorus versicolor cocoons were also obtained to establish two colonies of this parasite, the life-history of which is similar in some respects to that of Apanteles.

Work was then continued on Compsilura concinnata, a Tachinid fly, which deposits beneath the skin of the host caterpillar, the very small maggots which have hatched within the body of the female; these maggots establish themselves within the alimentary canal of their host and in two weeks have attained complete larval development, when they issue from the caterpillar, leaving it dead. Within a few hours they enter the pupal stage, and after a week the flies emerge, the females attaining full sex maturity in two or three days. Several colonies of this parasite have been liberated, and it should prove of great economic importance, as it will attack both the gipsy and browntail moths with avidity, and at least sixteen other insects native to Maine are known to serve as its hosts, including the cabbage butterfly and the tussock moth.

The beetle, Calosoma sycophanta, preys voraciously on the caterpillars both in its larval and adult stages. The eggs are deposited in the ground and hatch in from five to eight days, the larval life lastical about two or three weeks. The average number of eggs laid duried one season by one female beetle is about one hundred. C. sycophanta can apparently feed on caterpillars affected with the "wilt disease" without any ill results.

Two egg-parasites will also be imported. Anastatus bifusciatus and Schedius kuvanue. During the time that is needed for the parasite and predatory enemies to control the rapidly increasing infestationand assist in restoring "the balance of nature" which has been disturbed, hand-work must be continued and a very active warfare waged against the gipsy and brown-tail moths.

CUSHMAN (R. A.) The Calliephialtes Parasite of the Codling Moth. Jl. Agric. Research, Dept. Agric., Washington, i, no. 3, 10th Dec. 1943, pp. 211-237, 10 tables, 15 figs., 1 pl.

This parasite (under the names of Calliephialtes messor, Gray), and Ephialtes carbonarius, Christ) was introduced into California in 1904 with Spain, where it was found by Compere attacking codling moth California pomonella). Up to this time C. messor had been mentioned herature only once since its description; this was by Taschenberg, with in 1863 recorded it as having been reared as a parasite of Gallerot and Mondia, the wax moth. Specimens identical with C. messor have been identified as C. comstockii, Cress., and C. pusio, Walsh, by different authorities. From California specimens of the parasite were sent in 1907 to the Cape of Good Hope and were released there by Lounsbury; but the results were of doubtful value.

The author gives a detailed account of the methods used by him in rearing the parasite, and also of the anatomy of the insect in its various stages and descriptions of its habits in feeding and reproduction. typosition began about nine days after the emergence of the female, The stage of the host selected is the full-grown larva in its cocoon; 19 no case was any other stage attacked. The incubation period varied from 1 to 7 days, depending on the temperature; a table is given showing this variation. Calliephialtes is normally a solitary parasite, although more than one egg was often deposited on a single host; when this happened only one larva developed beyond the early stages. The larva begins feeding shortly after hatching, and continues until there is nothing left of the host but the skin, which is finally pushed to the end of the cocoon. The feeding period, from the hatching of the egg to the beginning of the cocoon, varied from 31 to 181 days, with an average of about 71 days. The larval period in the cocoon varied from 4 to 14 days; the females, after spinning their cocoons, required on the average about 21 days longer to attain the pupal stage than the males. The pupal period lasts from 6 to 13 days, and again the female requires somewhat longer than the male, to the extent on the average of about 1 66 days. The males outnumbered the females throughout the period covered by the observations, and it was found that the proportion of males increased with each succeeding brood. Of the 57 individuals reared from parthenogenetic eggs all were males.

The adults feed at all times on sweet liquids supplied to them; the males confined their feeding to this sort of diet, but the females frequently fed on the juices of codling moth larvae. Keeping the coroons in the cold retards their development, which, however, proceeds normally when the insects are removed from cold storage; in the present observations it seemed as if exposure to cold for any length of time had the effect of reducing the activity and vitality of the resulting adults. L. J. Newman, on the other hand, states that the keeping of immature specimens in cold storage for a period of 14 months in no way affected development nor the condition of the adult.

The first female to emerge from hibernation in the spring of 1912 appeared on 3rd May, and the last on 15th May; from the earliest female progeny three complete generations were reared and from the last, two generations. The insect hibernates as a full-grown larva in its cocoon. The females appeared in the spring a few days in advance

of the first adult codling moth, that is, about 40 days before they could, under natural conditions, attack the first brood of larvae of the moth. This would result in a very small first generation of the parasites unless they would attack some other host, since the hibernating broad of parasites would have passed the greater portion of their adult life before an abundance of codling-moth larvae could be found. To determine if Calliephialtes would attack other species of insects, larvae of Enarmonia prunivora, Walsh, Euzophera semifuneralis, Walk. and Gnorimoschema gallnesolidaginis, Riley, were placed in the propagating cages with ovipositing females of the parasite. A larva of Engrmonia was parasitised within two days, a diminutive male Callie phialtes emerging from the cocoon 22 days later; this specimen was much smaller than the normal full-grown larva and it is doubtful whether Engrmonia would serve in the long run as an alternate host. Neither of the two remaining species was parasitised. Codling moth larvae containing the internally parasitic larvae of Ascogaster carpocapsar were readily attacked by Calliephialtes; this always resulted in the death of the earlier parasite and the production of a diminutive adult Cultiephialtes.

Essio (E. O.). A New Eriococcus. Jl. of Entom. and Zool., Claremont, Cal., v. no. 4, Dec. 1913, pp. 179-181, 2 figs.

In this paper the author gives a detailed description of a new scale-insect. Eriococcus cockerelli. It occurs in Mexico, and has been reported on "Chino." As this is the Spanish word for quinine the plant probably belongs to the genus Cinchona.

FLETCHER (T. B.). Report of the Government Entomologist, 24th April 1912 to 31st March 1913.— Operations of the Dept. of Agric., Modras Presidency, 1912-1913, Modras, 1913, pp. 36-41.

The Report, which is the first since the entomological department became an independent section in April 1912, begins with a description of the organisation of the section, its laboratory accommodation and of its facilities for field work. Tours were made in many localities for the investigation of insect pests.

The Deccan grasshopper did considerable damage in the western taluks of the Bellary district in 1911, and a similar attack was expected in 1912. Accordingly cultivators were instructed in the use of bagnets, and were informed of the life-history of the insect and the preventive measures that may be used. The grasshopper seems to be increasing its area of distribution eastwards and southwards from the northern and western parts of Bellary; on first arrival in a new district it is little noticed as a rule, being in small numbers, but the insects increase rapidly, so that in three or four years they may cause the complete destruction of all the dry crops; after this their power is somewhat abated by the increasing efficiency of natural enemies, chiefly Cantharid beetles. The attack in Bellary in 1912 proved after all to be slight in the western taluks, but at Beeravalli a few hundred acres were found to be heavily infested. Another grasshopper. Epacromia dorsalis, was reported as attacking young ragi and daincha crops in Madura: the attack was over before steps against it could be taken.

The cotton-stem weevil (Pempheres affinis) does considerable damage sexotic cottons in the Coimbatore district, to which at present this post seems to be confined. The larva bores into the stem just above the ground, causing a swelling and weakening of the stem, so that heavy wind or rain often cause it to snap across. No successful methods of combat have been devised.

Caterpillars of Stenachroia elongella were found webbing earheads of cholam at Hagari; several cases of swarms of caterpillars of Sydoplera mauritia on paddy, fodder grass, etc., were reported. Namphula depunctalis was found attacking paddy, mostly in Malabar. Lindex apsilon was reported as causing great damage to potato plants 24 Yucand; spraying with different insecticides, collection by hand of the caterpillars, trapping caterpillars and moths, and laving down arrantive bait were all tried; but although large numbers were killed the attack remained so severe that about 80 per cent, of the crop was Investigation of this pest is being continued. The semi-looper goth (Acha melicerta) was taken on easter; sporadic outbreaks of this pest were checked by handpicking of the caterpillars. Azygophleps scalaris was found attacking Bengal daincha plants. Caterpillars of Link via conducta were the cause of damage to safflower; spraying with lead chromate was ineffective, but spraying with lead arsenate spackly checked any further damage. The caterpillars of Chilo suplex were found boring in cholam, etc., and those of Diatraca sp. in sugar-cane.

Coffee in the Nilgiris was badly attacked by the Pentatomid bug, Antistia cruciata. Scale-insects infested Babul (Acacia arabica) at toimbatore; predaceous enemies were present, but these in their turn were attacked by black ants (Camponotus compressus). Isolation of the affected trees by cutting away branches, etc., in contact with the ground, and painting a ring of tar and crude oil emulsion (half and halt) round the stem kept away the ants, when the natural enemies sauckly checked any further increase of the scales. The rice-bug Leptocorisa varicornis) was observed attacking paddy on a Coimbatore 54m; it was found by experiment that small hand-nets were more effective than large bag-nets for control of this pest. **cochossic attacked giant bamboo at Coimbatore, A Fulgorid, P adalnoga simplicia, caused severe but local injury to cholam at Combatore in August: as the insect lives protected inside the leafsheaths and only sucks the juice of the plants, measures such as sprayeg are useless: cutting the affected plants for fodder, or flooding the idd seem the only practical methods of control.

In November and December 1912, a blue-bottle fly bred in large tambers in the fish-offal along the coasts of South Kanara and Malabar. First flies flew inland and congregated on the spathes of the toddytodins, sucking up the toddy as it exuded, and discolouring the little flat remained with their excrement. The flies also infested the shops of toddy-sellers, causing considerable nuisance. A leaflet in English and in Kanarese on methods of protecting the collecting pots on the trees from access by the flies is being prepared.

Termites (Odontotermes) were found attacking young coconut palms a Quilandi. Malabar. The case was interesting because the species doing the damage appeared to be identical with that reported as

building mounds in the adjacent areas; as a general rule, moundbuilding termites do not attack growing crops.

Cholam suffered from the attacks of mites; the pest was checked by a Coccinellid beetle, which devours the eggs of the mite; 10 remedial measures have yet been devised; a similar mite, attacking sugar-cane seedlings, was controlled by dusting with flowers of sulphur.

Broods of Eri silkworms (Altaeos riciai, Boisd.) were kept through the year, but the climate of Coimbatore is too dry to suit the insect Steps were taken during the year for the improvement of the mulberry silk industry of the Kollegal district. A small number of univoluging the provedual control of the control of the provedual control of the Kollegal district.

Two cases of the importation of living insect-pests with sugar-cases sent from Antigna and from Java were met with during the year,

The report closes with some remarks on the future development of entomological work in Madras; it is urged that the present work of the Government Entomologist be divided into three groups:—(4) general routine work, (b) research in agricultural entomology, and on research in medical and veterinary entomology, and that each should occupy the whole of one man's time; the difficulty of doing justice to any one of these branches is pointed out as being very great for one man alone, while the need for research is emphasised by the citation of cases in which valuable crops have suffered serious damage through, lack of knowledge of the proper means of protection.

CHITTENDEN (F. H.). The Abutilon Moth. Bur. Enton. U.S. Dept. Agric., Washington, D.C., Bull. 126, 6th Dec. 1913, 10 pp., 5 pl.

During September 1909, many larvae and pupae of the abutilon moth (Cosmophila crosa, Hb.) defoliated okra, hollyhock, and abutilon on the farm of the Virginia Truck Experiment Station. The inser occurred in large numbers and was a serious pest. Hollyhocks and abutilon were attacked throughout the following November. Early in August 1912, the author noticed this species at work on the grounds of the Department of Agriculture, seriously injuring abutilon. Mr. J. F. Strauss collected this species on the 20th August 1912, on okta (Hibiscos vscalentos) at Washington, D.C. In all cases observed the some of the damage, while ants also invaded the open bolls, which the were devouring. In the author's experience abutilon is preferred to hollyhock. The insect does not spread to any great extent, and Hibisconay not prove to be its natural food-plant. A list is given of the various names under which this species has been described: a literature it has generally been mentioned as Anomis erosa, Hb. The moth very closely resembles the cotton moth (Alabama argillance).

Experiments were made on the infested abutilon with the following spray formula:—Nicotin sulphate (40 per cent.) \(\frac{1}{2} \) oz., whale-oil so \(\frac{1}{2} \) lb. lukewarm water 5 gals. The soap was thoroughly dissolved at the 5 gals, of water and the solution, after the addition of the nicotin was thoroughly agitated. During calm, clear weather the plants were sprayed in the morning, while some dew remained on them, and in the form of a fine spray or mist from all sides. Two days after the treatment about 90 per cent. of the larvae were dead. Four or five

properties to be alive were believed to have come from adjoining unsprayed plants. In a few days the plants began to take on a new appearance, putting out a second growth of leaves. Three weeks atterwards, however, another lot of larvae attacked the same plants, when discovered they were full-grown and about to inflict considerable court. The same solution was applied again; all the insects were era-licated, and the abutilon plants throve free from any pest up to the end of the season. It is believed that some of the insects were in the egg stage when the first spraying was carried out and that they are not affected when in this condition. None of the insects made their appearance in the Department grounds during 1913, showing either the absolute thoroughness of the application, or possibly that they prove returned to this particular locality. A bibliography of the opportunity literature concludes the paper.

PATTERSON (W. H.). Report of the Entomologist. Government of the Gold Coast, Report Agric, Dept. for 1912, Accra, 1913, pp. 22-25.

The slate-grey leaf beetle (Adoretus hirtellus, Castn.) has damaged carrie foliage at Aburi and Assuantsi and in cases of severe attack the leaves are skeletonized. Nothing is known of this insect's lifeestory. A solution of lead arsenate, 2 lb, in 50 gals, water, forms an efficient spray, but as this is too costly it is proposed to try lead chromate as an insecticide for insects on cacao. The grey moth pod-borer Characoma stictigrapta, Hmp.) does not cause primary damage of amportance, as usually the outer wall of the pod alone is eaten, but there is always a risk that the injured area may give saprophytic and parasitic fungi a hold. No instances have been reported as yet, but as the larvae are on the increase it would be well to destroy them when the pods are harvested. "Sankonuabe," "Akate," cacao bark-sapper, and bark-louse are various popular names which are given indisriminately to two distinct species of Capsid bugs, viz., Sahlbergella theobroma, Dist., and S. singularis, Hagl., which are both serious pests of cacao. Besides puncturing the bark and causing it to split open and die, these insects also pierce the developing fruits, thus producing "scabby" pods. In addition to this direct damage, there is also grave danger of fungoid infection. The red tree ants of the genus the cophylla are stated to destroy these pests and the author is informed that the native farmers are placing the carton nests in infested trees with favourable results. Thrips have been found in places damaging leaves and pods of cacao. Bag-worms or case-worms are found eating cacao foliage or branches. When these Psychid caterpillars are present in numbers sufficient to cause damage of economic importance the cases can generally be collected by hand and destroyed. The Longicorn stem-borers, Armatosterna buquetiana, White, and Girner sp., are rather scarce at present. White ants are reported to give much trouble on some farms.

The Adorstus beetle attacks kola in the same manner as cacao. Some of the damage to kola seeds formerly attributed to a weevil, living pastris kolae. Desbr., is due to a fruit fly (Ceratitis sp.), which it is teggs in the half-developed fruit, generally on the seed testa, on which the larvae feed exclusively. Though comparatively little harm sione, the seeds are not so readily marketable owing to their becoming

discoloured. To reduce the numbers of this fly infested fruits should be buried not less than two feet deep, the soil above them being well rammed down. Balanogostris kolae does not interfere with healthy kola fruits and if these are collected as soon as ripe no damage will occur.

Coconuts were injured at Assuantsi by a rhinoceros beetle (Archan contourns, F.). Collection was found an efficient means of control in a time. This beetle has also been reported as breeding in screwpipe, (Pandanus) at Tarkwa. Coccidate have not been very troublesome though Aspaliatus destructor, Sign., heavily infested the coconaplantations at Assuantsi. Though much hampered by the dry season the entomogenous red-headed fungus, Sphaerostilbe coccophila, was seen destroying the scales. A predaceous lady-bird beetle, Scanner, sp., is being established at Assuantsi to help control. Besides the above mentioned fungus, others of the same valuable group, viz Ophionectria coccicola, Aschersonia oryspora, Aschersonia sp. and as undetermined one, have been discovered. The leaves of you, Funtumia rubber in nurseries are often much injured by the Funtumia moth, Glyphodes occilata, Hmp. Parasites do not appear effective in controlling these larvae, as the only one yet found, a Tachinid fiv is itself heavily parasitised by a Hymenopteron. The remedietherefore available are: (1) the picking or squeezing of infested leaves; (2) the dusting of the dew-moistened leaves with a mixture of Paris green 1 lb. and air-slaked lime 6 lb.; (3) spraying with lead arsenate, as recommended for the Adoretus beetle of cacao.

The growing crops of corn are not seriously troubled by pests, but enormous loss is caused to the harvested grain by the corn weeval Calandra organ. L., which starts its ravages with the ripe grain in the fields. The author hopes that provision will be made for the fundigation of all seeds and plants at the ports. One instance showing the need for such a measure is that a small consignment of mango seed from Ceylon was found to contain a number of mango-seed weevils. Craptorthynchus sp.

BALLOV (H. A.). Work connected with Insect and Fungus Pests and their Control. Report Agric. Dept., St. Vincent for 1912-1913. Barbados, 1913, pp. 11-17.

Cotton pests. The prompt and vigorous use of Paris green checked the ravages of the cotton worm (Alabama argillacea), this being the second time since the re-establishment of the cotton industry that artificial control was necessary. The pest occurs every year, but is combated by its natural enemies, of which the "Jack Spaniard" wasp (Polistes annularis) is the most important. In Bequia, one of the Cays, where the worm abounds, there are no Jack Spaniards or at least very few. Planters must always be prepared to resort to poison immediately it is found that the caterpillars have not been held is check by their natural foes. The freedom from leaf-blister mit (Eriophycs gossypii) appears to the author to be the result of extreme vigilance on the part of the planters and others concerned in keeping down this pest. The Ordinance which provides for the destruction of old cotton at such a time as to cause a complete break each year in the food supply of the mite, seems especially useful. Black scale

Sucsetia nigra) is a serious pest at times, but over small areas. It is not parasitised to anything like the same extent in St. Vincent as in Barbados, where the Chaleid, Zalophothrix mirum, appears to be a none efficient check on the scale than in other islands. For several cars past a small bronze beetle has attacked young cotton in St. Vaccent and the Cays, eating the leaves and probably causing a certain

amount of injury to the plants.

respect pests. Though present in all parts of the island, scales and winterly only occasionally occurred in such abundance as to indicate any great damage being done. The Bourbon scale (Aspidiotus descritor), the tessellated shield scale (Eucalymnatus tessellatus), and occasionally the black lime scale (Ischnaspis longirostris) occurred in The Eucalymnatus appeared to be well controlled by some numbers. the fungus, Cephalosporium lecanii. Two species of whitefly occurred, 11 arodicus cocois, Curtis, and a species of Aleurodes, which frequently is found in company with it. If remedial measures become necessary, catting out the old leaves and spraying the remainder with a contact insecticide would seem the best course to follow. Judging from some small trials, "Scalo" appears of value for this purpose. Every injury or cut in a coconut palm should be tarred immediately to prevent egg-This weevil (Rhynchophorus palmarum) laving by the palm weevil. occurs generally throughout St. Vincent and appears to be greatly on the increase. The clearing of land for cotton-growing is responsible for this. Among the growths cleared were gru-gru palms (Acrocomia lasjospatha) which were ordinarily killed by the larvae of the palm weevil after a few slashes with a cutlass had been made in the trunk to aid the female weevil to gain access to the soft part of the stem for the purpose of egg-laying. All plantations of coconut palms must be catefully watched and at the first sign of attack the grub must be dug out and the wound treated with an application of tar. The softer portions of the stem of the gru-gru and coconut palms, cut in lengths of, say, 3 or 4 feet, and split in half, might be used in coconut plantations is traps for the palm weevil. They should be collected after some four or five weeks and destroyed, and a new lot put down for traps.

Arrowroot pests. The arrowroot in all parts of St. Vincent seemed to be healthy and not injured by insects. The most common and best shown pest is the arrowroot worm, the larva of a "Skipper" butterfly, Udpedes ethlius. In St. Vincent the worms are searched for in the folled leaves and, when found are crushed with the fingers. The bildiumnes of arrowroot are often attacked by some insect which tunnels not them, forming cavities which fill with soil and cause much extra work in the preparation of starch.

Line pests. In all parts of the island citrus trees are attacked by sode-insects; black blight is to be seen on practically every citrus tree, and in the majority of cases in considerable abundance. The treen scale (Coccus viridis) and the white scale (Chionaspis citri) are cost frequently seen, while purple scale (Lepidosaphes beckii) is musually rare. Green scale is very common and seems to be parasitised by the Cephalosporium fungus to such a degree as to prevent its becoming a serious pest.

fround-nut pests. The Pentatomid bug, Edessa meditabunda, Macks ground-nuts in St. Vincent. The author does not know whether spraying would be profitable, but suggests that experiments

be made with "Scalo." This insecticide is a mixture of whale-oil soap and kerosene, the formula for which has been worked out by Mr. J. i. Moore, Agricultural Superintendent, St. Lucia. The stock mixturise easily diluted in water, the soap holds an unusually large percentage of kerosene, which does not separate out even when kept for a long time. To control the bug, spraying would have to be done at a time when the eggs were hatching or had just hatched when the greates number of young were present. Ground-nuts are also attacked by several other bugs, and by a small caterpillar which tunnels into the turn of the stems. Mole crickets are also said to damage them.

tips of the stems. Mole crickets are also said to damage them. Cussion pests. The cassava at the Agricultural School was attacked by a species of Thrips which caused a considerable deformation of the leaves, but the author does not believe that it causes very much injury to the crops.

Pigeon pea pests. The white scale (Hemichionaspis minor) is controlled to a large extent by parasitic insects and is not likely to cause much injury to pigeon-peas when these occupy the land as a 12-15 months crop, but if allowed to remain a second season they are likely to become seriously infested, even to the point of infecting adjoining cotton fields. No specific directions can be given for the control of the eaterpillars which sometimes eat the leaves, or of the weevils which attack the pods; but it is hoped planters will report the first appearance of any of these pests so that more complete knowledge may be arrived at.

Writing after the date of the above report the author mentions that the cotton worm continued to spread but was heavily parasitised by two Chalcid flies, Chalcis ocula and Chalcis sp., and quickly disappeared. This outbreak drew attention to the desirability of giving still further encouragement to the Jack Spaniard. A trial was made with a small open shed, and a point clearly brought out was that effective shelter from wind and rain is necessary and that the roofs of the sheds should be raised to a height of not less than 7 feet so as to allow the nests to hang well above the heads of labourers who may take temporary shelter in showery weather under the sheds. "Scalo" has been found very effective, and if used at the rate of 1 lb, to a gallon of water was found not to damage any but the very tender plants.

A "Stoppeur" air-compressing pump and four compressed air knapsack sprayers proved very effective. Specimens of the "Furet" duster were also obtained. This is quite the best type of appliance so far used for applying insecticides in powder form. It is worked by one hand alone, and by a simple contrivance it can be regulated to eject a fine, medium, or heavy dust.

Report on the Experiment Station, Tortola, Virgin Islands, 1912-13. Agric. News. Barbados, 8th Nov. 1913, p. 363.

The heavy rain in October promoted the cotton crop, but insect pests also multiplied, and a severe attack of cotton worms (Alabara argullacea) resulted in many districts. To allow peasant growers to deal with this pest, considerable quantities of Paris green were given away. With Sen Island cotton, success has followed selection work with Cameron 106, a strain numbered 12-5 being remarkable in that it is a late bearer, remarkably vigorous, and decidedly resistant to leaf-blister mite.

Insect posts at St. Croix.—Agric. News. Barbados, 22nd Nov. 1913, p. 378.

The most important sugar-cane pest in St. Croix (D.W.I.) is the manoceros beetle, *Strategus titanus* [see this *Review*, Ser. A, i. p. 254] and the pink mealy bug, *Pseudococcus sacchari*, is of fairly frequent courrence.

A pest of oranges.—Agric. News, Barbados, 22nd Nov. 1913, p. 378.

The occurrence of a pest causing injury to oranges in Dominica, has pecently been reported. It is a small moth related to the codling with (Cydia pomonella). The larva injures the fruit by penetrating the skin and feeding in the pulp of the orange, which becomes discoloured and rotten in the vicinity. Even when no further injury is done than the puncture of the skin, the fruit is rendered unsaleable on account of the discoloration at the point of attack and the malformation which often results. This pest was first noticed in 1907, and again in 1908. Remedial measures, and especially spraying with lead arsenate, led to complete control in 1909 and 1910. Since then no records of its occurrence have been received until 1913. The agricultural officers in Dominica state that the attack begins in May or June, the egg being laid on the surface of the fruit. During August, the larval stage is completed and the full-grown caterpillar leaves the fruit (which by this time has fallen to the ground) and enters the pupal stage amongst the leaves on the ground. About two weeks later the moths emerge. What becomes of the insect in the other months is not known. The most successful control resulted from spraying with 'ead arsenate, applied early in the season, in order that the newly batched caterpillars may be poisoned as they attempt to eat their way through the orange skin.

FERRII (F. W.). Entomologist's Report.—Minutes Meeting Board Agric, on 21st Nov. 1913, Trinidad, pp. 53-54.

Froghoppers. During the years 1912 and 1913, 51 fields out of 110 on an estate in the Couva district of which a record was kept were affected. In 1912, 25 fields were badly affected, 19 slightly, and 7 had so blight. In 1913, 8 fields were badly affected, 24 slightly and 19 tad no blight; 6 fields were badly blighted in 1912 and 1913; 5 fields were slightly blighted in 1913 which were not so affected in 1912. Ratoon canes were mostly affected. Egg-pacasites: -- The arvey for the occurrence of egg-parasites is not completed yet, but to the end of September 1913 they occurred in 12 fields and with the exception of one, none of the fields had blight at any time during 1912 and 1913. The single field referred to was only slightly blighted in oth years. Green Muscardine Fungus: - In 1912, of the 51 fields 1 (were sprayed with fungus spores, and in 1913, 16 fields were similarly leated: 12 fields with blight sprayed with spores in 1912 showed blight in 1913; 7 blighted fields, although sprayed with spores 1912, showed blight again in 1913, but as a rule the blight was wallt, showing that some good was done. Spread of Froghoppers: 45 1913, five new fields were attacked and all were near fields affected > 1912, showing that the spread of the froghoppers was restricted for the period under review.

Cacao: Since the last meeting there has not been any increase in Thrips and cacao beetles, the former are still in abevance and the latter are being caught in places where the trees are in bad condition, either owing to soil or exposure to wind and sun. The author reports that more interest is taken in the control of cacao beetles in the southern part of the Island and small quantities of arsenate of lead are being issued to peasant proprietors.

KRÄNZLIN (). Die Wollausplage in Daressalaam. [The Mealy Bug plague in Dar-es-Salaam.]—Der Pflanzer, Dar-es-Salaam, Oct. 1913, ix, no. 10, pp. 493-507, 6 pls.

In November 1911, the park authorities in Dar-es-Salaam reported that a Pongamia glabra tree was apparently the victim of a pest, and inspection showed that all the lebbek trees (Albizzia lebbek) were The author states that the insect is native to East Africa, where its occurrence has been reported before in various places. but it is not peculiar to the region, for Newstead and Willcocks have published an account of its appearance in Cairo in 1909 (Bull. Enton. Research, i. pp. 121–141). Its name is Pseudococcus filamentosus, Ckll. (Ductylopius perniciosus, Newst. and Willcocks). It is not supposed that ants act as carriers of the bug, although they feed on its sugary excreta, but birds are believed to be agents in its sudden appearance in localities far distant from infested areas. Besides Albizzia lebbek which suffers most severely, Pongamia glabra, Pithecolobium saman, the silk-cotton tree (Eriodendron unfractuosum) and citrus trees are complete hosts; but the bug also thrives on the following, though not to so marked a degree: Sapindus saponaria, Chrysophyllum cainita, Landolphia sp., Tectona grandis, species of Ficus, species of Bambasa Khaya senegalensis, Sterculia alata, cotton (but Hibiscus remains untouched), Melia azedarach, Palms (only on the head when flowering). grasses, Agare americana var. sisalana, A. rigida, Encephalartus, Arum, Adansonia digitata, Albizzia odoratissima, A. procera, A. stipidata, Acacia catechnoides, Forsteronia floribunda, Swietenia makagom, Calophyllum inophyllum, Vitex cuneata, and Sorindeya. The author points out that Sapindus saponaria may perhaps be placed among the complete hosts. The others only appear to harbour the mealy bug when they are close to a centre of infection. But attention is drawn to the fact that the insect seems capable of adapting itself to plants which at first did not appear suitable. An example of this is provided by the mango trees (Mangifera indica) in the suburbs of Dar-es-Salaam, which seemed immune for a long time, but gradually became badly infected. Trees and plants which apparently enjoy immunity are: Terminalia, Ponciana, Caesalpinia pulcherrima, Tamarinds. Casuarinas, all varieties of Eucalyptus, Pandanus, Plumiera, Pelto pharum, Santalum, Banhinia, Bouquinvillen, Pithecolobium dula. Syrugiam quinceuse. Alamanda, Theretia neriifolia, Barringtonia racemass, Americalism occidentale. Adenanthera and many varieties of Sterration

The tayages were so sudden and so destructive that immediate and drastic measures were necessary to stamp it out. The enormous cost of spraying big trees infested by so infinite an insect could not be faced. It was therefore decided to lop away all foliage and twigs and scrub the bare stumps with a spray-so ution made up as follows:

The of hard soap is dissolved in 1 gal. of hot water; while this tion is still hot 7 quarts of petroleum are added and the whole greed, till emulsified. When cold, water is added to a total bulk at 20 gals, and the insecticide is ready for use. Grass and undergrowth removed where present, and some very badly damaged trees gare felled. At the end of the chief rainy season the lebbek trees were parted with foliage in which but few of the insects were noticeable. the other trees which had been cut back were free. Those trees and Parts which were not complete hosts were now free with the exception i those mangos on which the insect had adapted itself; these were still rather heavily infested. But success was only apparent. Writing war after the foregoing measures were resorted to, the author sares that the lebbek trees were infested anew and the others, though salt free, would be infected in time. A repetition of the former drastic without would probably kill the trees. A species of lady-bird (OCCINELLIDAE) has proved a natural enemy and from being rare to now multiplied exceedingly and is found on every lebbek tree. A bird, one of the common mouse birds (Colius), also prevs on the Psychococcus, but is a doubtful auxiliary, as it may carry infection. In view of the fact that lebbek trees are short-lived the author thinks visit the selection of other species for re-planting is the only satisfactory adution. The removal of existing Albizzia would only anticipate by ware years what would be ultimately unavoidable.

BARR (W.). Die Bedeutung der insektenfressenden Vögel für die Forstwirtschaft. [The importance of insect-eating birds for forestry.] Aus der Natur, Leipzig. July, 1913, ix, pp. 659-671.

It is well known that birds consume enormous quantities of insects. be example of this was provided by two great tits (Parus major) which devodred 187 pupae of Malacosoma neustria, L., in 13 hours; and again three blue tits (Parus coeruleus) and three cole tits (Parus ater) consumed 9,500 to 10,000 eggs of the processionary moth daily for a time. Three marsh tits (Parus palustris), one cole tit, one long-tailed 🕾 (Parus candatus) and two gold crests (Regulus regulus) made away with 1.876 caterpillar of Bupalus piniarius, L., in a single day. Recent crestigation of this subject is based on very numerous examinations i stomach-contents undertaken by the Biologische Reichsanstalt für Land und Forstwirtschaft, the Forstakademie Eberswalde, the Forstakademie Tharandt, the members of the Bayrische ornithogischen Gesellschaft, the Leipzig Ornithological and Entomological Societies, and many others. The most important works have beta recorded by K. Eckstein in his annual reports in the "Allgem. Forst and Jagdzeitung." The results of this particular investigation does that birds have a preference for certain insects. This may aply either to all birds or only to certain species. In many cases also revestigator is surprised at finding in their stomachs insects which in hidden and apparently secure from pursuit. The following is a any limited list of some of the chief instances from the wealth of facts deried in this paper:-The starlings and ravens devour the larvae (Tane-fly (Tipula) and those of Elaterid beetles, as well as the equillars of Agrotis. The roller (Coracias garrula) devours

Hylobius abietis, a dangerous forest pest; the carrion crow (Core, corone), starling, partridge, etc., also feed on it. The grub of the cockchafer is a general delicacy and one much appreciated by the crow and starling, and it has been proved to be the prey of birds which are not at all suspected of seeking after it, such as the common buzzani the green woodpecker (Pieus ciridis) and the cuckoo (Cuculus canorus Grasshoppers are a favourite food of practically all birds, and investigation shows that this applies in a large measure to the earwiwhile the mole-cricket is also a general victim, and even the eagle on (Strix bubo) pursues it. All the smaller birds devour the oak Tortr. (T. viridana). The larch miner (Coleophora laricella, Hb.) appears to exercise a very great attraction for the smaller birds, among which ticole tit takes first place in this respect. Some surprising results have been obtained in Austria. On one occasion the crop of a wood-pigeog contained 674 pupae of Tortrix murinana. Besides these, which were counted, there was a remainder estimated at about 300. This discoverwas followed by that of 122 in a cole titmouse; 200 and 300 in two missel-thrushes; and 53 in a blackcap. Those insects which attack timber are naturally of special interest in forestry. Here again birds are very active. The larger spotted woodpecker (Picus major) seek. after the Longicorns, Superda populnea and Tetropium castaneum, the big bark-beetle (Dendroctorius micans), and the larva of the leopar: moth (Zeuzera). Passing to the nun moth (Lymantria monacha, 1. Dendrolimus pini, L., and other serious forest pests, the author remarks that the starling is not always to be relied upon as a means of control, but in many instances this bird has cleared infected areathoroughly and quickly. The foresters of the See Estate, in Prussia: Oberlausitz, consider that the distribution of 600 starling-boxes is their woods once saved these from the nun moth, while neighbourned properties were damaged. It was also noticed that in those placewhere the boxes were fewest, the traces of the insect were seen the earliest. But the cuckoo is the regular and most formidable enemof the nun moth. A good example of its activity is reported by Altun who states that in 15 days about 100 cuckoos absolutely cleaned on what threatened to be a dangerous centre of infestation. The much abused jay (Garrabis glandarius) also prevs unceasingly on the na moth, caterpillars, pupae, and egg-bearing females of which are found in its stomach even at times when the pest is thought to be quite r. abeyance. Such finds are naturally a practical guide to the forester The cuckoo is singular in its taste for the processionary caterpillar which it devours with avidity, while other birds strictly avoid? Indeed it is believed to have nipped in the bud infestations which showed every promise of rapidly spreading to a ruinous extent. Though a very great number of birds decimate the caterpillars of Dendrolin . pini, yet here again the cuckoo distinguishes itself above all others The golden oriole (Oriolus galbula) and the jay are also useful in the respect, and one instance is particularly reported where the form effectually checked the ravages of the caterpillars when they appeared in spring. In the case of most sawflies it again occurs that the cuckeis nearly always the sole enemy of the larvae when the latter are feeding When later on they are in their cocoons, other birds seek them on In a small birch wood which had been nearly stripped by Crocses septentrionalis, 17 cuekoos appeared and cleared off all the larvae.

These are but a very few of many examples which prove the andoubted value of birds to the forester. That birds destroy useful meets and the parasites of insect pests is undeniable. In this contection it is mentioned that ichneumons are very seldom found in a sard's stomach, but this is only an exception to the general rule, which may sometimes render these feathered allies doubtful auxiliaries. In endasion, the author points out that both spraying and fumigation destroy the parasite as well as the pest; that the cost of bird protection is low; that birds are able to hunt out concealed pests, some of which as for instance the oak Tortrix, larch miner, the processionary actorpallar. Zenvera, Saperda and wood-ants, are not amenable to nechanical control.

Morestatt (H.). Die Wanderheuschrecken und ihre Bekämpfung, [Locusts and their control.]—Flugblatt zum Pflanzer, Dar-Essaham, Dec. 1913, no. 7, 7 pp.

by German East Africa locusts only appear at intervals of several cars, far less frequently than in countries farther south. They scarred in 1893, 1898, and 1903–1904, and one swarm alighted in West Usambara in 1905. On the 20th Nov. 1913, shortly before the beganning of the monsoon, some scattered swarms were observed in Usambara, coming from the north-east. They come from the interior of the continent and belong to the yellow or Egyptian species (Schistococt progrima, Oliv.). Regarding control, the methods and formulae given are those in use in South Africa. Full reference is made to the work at one time carried on by the South African Central Locust Europe and the paper concludes with a bibliography.

MARTHELLI (G.). Prime esperienze in Italia sull'impiego dei vapori di acido cianidrico contro le Cocciniglie dannose. [First experiments in Italy with hydrocyanic acid against Coccids.]--Giorn. Agric. Merid., Messina, vi, nos. 10-11-12, Oct.-Nov.-Dec. 1913, pp. 169-174.

In Sicily the closeness with which the lemon trees are planted leads to the entangling of their branches, so that fumigation with hydromes acid—the most powerful control known in the United States and Spain—appeared impracticable. An opportunity of testing this self-od having occurred, the author found that many of the difficulties appelended did not exist. In fact, the occasions on which the bracation tent could be used were fairly numerous, as in the case of icong trees, trees which have been radically pruned, and trees growing actions of three or four. The cost of this method has not been worked to the fairly believes that under certain conditions of co-operation among the Siedlan growers, economy may be expected. There is no doubt so its efficacy. Comparative examination showed that of several braches of Coccids found on fumigated plants 97.3 per cent, were dead, whereas only 10.3 per cent, had died from natural causes on plants which had not been treated.

MARTELLI (G.). La Thea 22-punctata, L., è solamente micofaga [Thea 22-punctata is exclusively mycophagous.]—Giorn. Agr., Merid., Messina, vi, nos. 10-11-12, Oct.-Nov.-Dec. 1913 pp. 189-195.

Then 22-punctata is an abundant ladybird in all parts of Sicily. June it completes its cycle in 19-21 days, while in August this take, 24-28 days. According to these figures seven generations may over a from May to October. The author finds that neither the adult is the larva feeds on aphids, and if aphid-infested leaves or twigs at feel to them they die of starvation. They feed on the conidia art spores of various species of Oidium found on the pumpkin, Plantago state culgaris, various Brassicaceae, the oak, the hawthorn, Chemoritality, Euronymus sp., and the vine. The adult is also able to use the sugary substances excreted by the leaves of some plants and the larva sometimes sucks the eggs of Thea itself. The author the establishes the fact that Thea 22-punctata is normally mycophagous

Rondani recorded the Dipteron Aphiochaeta (Phora) fasciata, Fasas a parasite of Coccinella 7-punctata, L., and the author has found killing Thea 22-punctata, and also attacking Adonia carriegate, the active enemy of the yellow-green aphid of the capsicum. The challenemy of Thea is Homalotylus flaminius. Dalm., a Hymenopter-already known as parasitising other Coccinellids. Homalotylus mainfest up to 38 per cent. of Thea larvae.

THIELE (H. H.). Coconuts in Fiji. - Trop. Agric., Peradeniga, x no. 6, Dec. 1913, pp. 458-462.

Coconut cultivation on the island of Viti Levu was practically givup many years ago, owing to the serious injury done to the leaves by a small moth, Levunum icidescens, B.B., not hitherto found elsewhere. Since the end of 1912 a change has taken place in the appearance of the coconuts in most parts of the island and the author thinks the chance of combating the pest successfully has now considerable increased. No control measures are given in the paper.

RUTHERFORD (A.). Zeuzera coffeae (Red Borer; Coffee Borer). Te j Agric., Peradeniya, xli, no. 6, Dec. 1913, pp. 486-488.

This insect is widely distributed in Ceylon as a pest of tea. It presence is indicated by the withering of the leaves and by casting ejected by the caterpillar from its burrow. These castings are oval cylindrical in shape and yellowish or crimson in colour. If one of the attacked branches is cut open, a tunnel, widening out at irregals intervals, will be found running along its centre. These wider portions are of the nature of lateral galleries that may reach almost to the origide. The width of the tunnel depends on the age of the caterpillar and the galleries of the young larvae are usually straight. The galleries may be so extensive as to girdle the stem; they may also go down into the roots. When full-grown the larva cuts a circular traddoor for the exit of the moth. A variety of insects has been found to the tunnels and in some cases they have been mistaken for the reacularity.

The Zeuzera has been found feeding on the following plants in

teylon: -Tea, coffee, loquat, cotton, avocado pear, "china apple," orange, Grevillea, teak, Cassia auriculata, cinnamon and Erythraxylon. In India it is recorded from tea, coffee, sandal and cotton. Being a general feeder it is difficult to deal with. Affected branches should be cut down until untunnelled wood is reached and the larva or papar, the tunnel killed. Sometimes, as when the tunnel goes below the ground or into the body of the bush, this is not possible. In such a case the pruning should be carried as low down as possible, and the tenant of the gallery killed by prodding with a sharp wire or by putting and dosing the hole with clay.

RUTHERFORD (A.). Mites. Trop. Agric., Peradeniya, xli, no. 6, Dec. 1913, pp. 490-494.

Dry, finely-divided sulphur has been regarded as a specific against nates, but recent work in the United States shows that is not so in all cases. Dealing with the red spider (Tetranychus bimaculatus, Harvey) it was found that "sulphur is effective only when the infested surfaces of the plant are exposed to direct sunshine at some time during the day, or to intense reflected heat." In Ceylon, where sulphur gives good results, one or other of these conditions is usually satisfied. Dry sulphur should be applied when the leaves are wet with dew, or, failing this, they should receive a preliminary spraying with water; preferably there should be no wind at the time of application. In Cevlon the cost of applying sulphur at the rate of 10 lb. per acre, preceded by a spraying with water, has been found to be about 2s. 4d. per acre. Sulphur is now applied in California along with hydrated lime (which may be prepared by adding 32 lb, of water to 100 lb, of quicklime) as the latter causes the sulphur to adhere to the leaves, and also acts as a carrier. The nozzle should throw a washing, rather than a misty, spray. The pressure must not be less than 120 lb. and angle-nozzles or bent rods are necessary in the case of mites infesting the under surfaces of leaves. The Yellow Tea Mite (Tar-somenous translacens, Green) is probably the most common and most injurious of the mites affecting tea in Ceylon. It is most abundant on the underside of the leaves, where the small whitish eggs and the mites can be seen even with the unaided eve. The mite occurs chiefly on the two or three leaves nearest to the unopened buds, but also on the later, on the young stem, and, sparingly, on leaves below the two or three that are most heavily infested. Green records this mite as badly attacking Cosmos sulphurea, a composite, and the author has seen the same, or a very closely allied mite, in injurious numbers on leaves and young stems of a small solanaceous climber (Solanum venustum). The leaves become bronzed and withered and frequently drop off. This plant was exposed to the full rays of the afternoon sun.

Mites of this group are usually vegetable feeders and many are of great economic importance. Tarsonemus oryzae, Targ.-Toz., causes a disease of rice known as "bleaching" in Italy. T. spirifee, March., ptoduces distortion in the panicle of oats in France and Germany. T. railei, Banks, is associated with a peach-bud disease in the United States. T. bancrofti, Mich., injures sugar-cane in Barbados* and is 1*The Barbados form has been described as a distinct species, T. spinipes, llirst (Bull. Ent. Res. iii, 1912, p. 325).—Ed.]

present on sugar-cane in Queensland. T. ananas, Tryon, is the fore-runner of a disease of pine-apples known as "fruitlet core rot" in Queensland. T. culmicolus, Reuter, causes a disease of grasses in Finland. T. tatus, Bks., was found injuring mango plants in Washington. T. approximatus, Bks. MS., and T. assimilis, Bks. MS., have been con Citrus in California. T. buxi is stated by Green to have destroyed every box-tree in the Botanic Gardens at Turin in one season.

The ribbed tea mite, Phyloptus carinatus, Green, is recorded in Ceylon from Kegalle, Ukuwela, Nuwara Eliya, Haputale, Peradeniya, Gonakelle and Passara. A bush badly attacked by this mite has every leaf, except the young flush, of a whitish green or a deep bronze-colour, resembling those of copper beech, the discoloration being more marked on the upper surface. The mites are very minute. Watt and Mann give the distribution of this mite as Assam. Darjeeling, Duars and Ceylon.

Schneider-Orellt (O.). Von der Blutlaus. [The Woolly Aphis (Schizonenza lanigeza, Hausm.)]. Schweiz Zeits, für Obst. and Weinbau, Frauenfeld, xxii, no. 23, 10th Dec. 1913, pp. 354-360, 6 figs.

In 1909, Börner stated that the woolly aphis does not normally lav its winter eggs on apple-trees, but on another host-plant, then unknown. In 1912, Dr. Edith Patch obtained direct proof that this insect changes its host-plant, and she was led to conclude that the woolly Aphis (Schizoneura lanigera) and the American elm-leaf aphis (S, americana) are not specifically distinct, but simply different stages in the development of a single species [cf. this Review A, i, p. 21]. According to this, in the United States the winged forms of the woolly aphis migrate in autumn to the American elm (Ulmus americana), where the sexual forms and the winter-eggs are produced. In spring the newly hatched insects and their young suck the elm leaves and cause the characteristic gall formation. Early in the summer the winged forms appear, and return to the apple and similar trees, there parthogenetically producing colonies of woolly aphis. In Europe the American clim is very rarely available for this change, but European species (U. campestris, U. effusa, U. montana) abound, and on all of them especially on *U. campestris* galls like those observed by Dr. Patch are often found. But these galls and their producer (S. ulmi) have been known since the middle of the 18th century, long before the woolly aphis appeared. Another point which shows that the two forms are distinct is that Mordwilko and Tullgren have proved that S. ulmi regularly migrates to the roots of the current and gooseberry and there produces colonies of white woolly individuals; further, Dr. Patch has recently stated that the antennae of the woolly aphis (including the American elm-aphis) differ considerably from those of the European elm-aphis. This statement is confirmed by the author. who is satisfied that the European elm-aphis (S. ulmi) is a different insect from the woolly aphis of the apple. It remains to be ascertained whether in Europe the woolly aphis passes the whole of its life-cycle on apple, or whether it does actually migrate to elms. To decide

this point definitively winter-eggs must be obtained and the larvae which hatch out in spring must be placed on European and American class, and also on apple-trees. Details are given of some experiments carried out by the Experiment Station at Wädenswil with the object of breeding winter-eggs for infection tests. The result of these experiments was that about 500 winged individuals produced 200 females and 70 males, which in turn have given as yet 42 living winter-eggs. Though not especially favourable, this is satisfactory when compared with former attempts.

MOORE (B. A.). The Wheat Louse (Toxoptera graminum). Agric. Jl. Union S. Africa, Pretoria, vi, no. 3, Sept. 1913, pp. 482-492, 12 figs; vi, no. 5, Nov. 1913, pp. 767-772; vi, no. 6, Dec. 1913, pp. 973-977; vii, no. 1, Jan. 1914, pp. 50-60.

In South Africa the first record of the wheat louse is in the 1903-04 report of the Manager of the Potchefstroom Experimental Farm, but according to old farmers the pest had been present for many years before. It is generally distributed over the wheat-growing districts taxing an altitude of between 3.500 and 5.000 feet. In South Africa there seem to be but two forms of the insect, namely, the winged instructory females and the apterous females; males and oviparous remales have not been seen.

All the individuals of the wheat louse reach maturity in about seven days from birth and produce young without fertilisation. During sammer the louse lives about 32 days, producing, under favourable conditions, three young daily for a period of 25 days. These are the conditions in the wheat fields about August. September and October. About the end of October or the beginning of November the grain, septeaching maturity, becomes too tough for the wheat louse. By this time the winged females have developed, leaving the grain and solding out grasses upon which they can spend the summer when no ceteals are available. If, as a result of drought, there is no grass, the deat majority of the aphids die; but some of them are saved by a common ant, Plugiolepis custodiens, Sm., which carries them off and baces them on the underground stems or roots of the grasses on which they can live. Here they are tended by the ants, which are repaid by teneydew secreted by the aphids.

The wheat louse may be found upon wheat, oats, rve, or barley; stimm winter it occurs on the main cereal crop, during summer on stay plants. If there are no cereal crops in winter, the louse is found of fescue grass (Bromus willdenowii). During summer it frequents affectent grasses, such as Johnstone grass (Sorghum halepense), goose-cass (Eleusine indica), sweet grass (Panicum laevifolium), teff grass and millet: C. P. van der Merwe mentions also kweek grass (Cynodom halefum) as a host plant. The louse has not been found on Paspalum denatum, even when growing side by side with infested Johnstone

In the United States a very small Braconid wasp (Aphidius testiceipes) increasfully controls the wheat louse. In South Africa several species of Aphidius occur, one of which multiplies rapidly under favourable institutions. Should the wheat louse not be abundant in the field, the Aphidius is able to breed in certain other species of aphids, but directly

the Toxoplera become more abundant the Aphidius returns to them An important predaceous insect is the black-spotted ladybird (Adaly) flacomaculata), which during the larval and adult stages feeds on T. graminum and a large number of other aphids; the red-spotted lady. bird (Chilomenes lunata) and the black ladybird (Exochomus migromaculatus) are also important predators. Of the several different species of Syrphid flies, the larvae of which feed upon T. graminum, Xanth. gramma scatellare is the most important. The lace-wing flies (Chrysope sp.) are of less value. The ladybirds and Syrphids are themselves attacked by parasites: the former by a Braconid wasp (Dinocanepa). sp.) and a Chalcid (Homalotylus sp.), the latter by an Ichneumon Bussus luctatorius. The Syrphid is of considerable value as it is the first enemy to appear in an infested field. Owing to the abundance of ladybirds, the value of the Aphidius is not so great in South Africa as in America. A ladybird will destroy a given number of wheat he in a shorter time than will the Aphidius, but while it is feeding on the lice it is also destroying the Aphidius. After the work of all the parasites and other enemies, a few individuals or colonies of the aphiremain to carry on the species. On Johnstone grass the individuals underground always furnish a source from which new colonies can be formed, and the insects are able to pass through the summer successfully, although greatly reduced in numbers. Under cold conditions however, the balance is in favour of the wheat louse. The Aphidos may be neglected as a means of control below a mean of 55° F., while the louse is still breeding well as low as 50° F., and is not greatly retarded until a mean temperature below 40° F, is reached. Of the ladvbirds, the effect of cold seems to be greatest on the Exochomus; the Adalia withstands the cold much better than either of the other twand is quite active at 50° F. Adult Syrphid flies can almost always be found all through the winter, though they breed very slowly, and their parasite (Bassus) persists with them.

As a general rule aphids can be controlled by spraying the plantwith paraffin emulsion or tobacco extract and soap, but since a field sprayer would have to be used, this entails a large expenditure which would practically take all the profit on the wheat. On this account the main measures should be directed to prevent the attack. The best prevention of a serious loss is irrigation, and where irrigation is not feasible the ground should be carefully prepared so as to conserve a much moisture as possible. The ground should always be rolled Under irrigation, fertilisers can be used to make a strong healthy plant able to withstand the attack. Good rotten farmvard manure is the best fertiliser for this purpose, and the best results would be obtained? it were applied in the early spring. Barley is most severely attacked by the wheat louse in South Africa; rve could be better grown that barley, and the variety of oats known as winter oats is only slight? attacked by the louse. Of the varieties of wheat tested for resistance to the louse, "Spring Wheat," "Wit Klein Koren," "Russiat Kubanka Durum," "Bombay" and "Minnesota" seemed the best If an attack starts in one part of a field and the rest of the field is conparatively free, that area should be burned down. If such spots are promptly dealt with the whole field may be saved. The use of the brush drag or the roller is said to give good results, but it is doubtful if they are really worth the labour. Probably the best treatment of an

infested field would be to turn sheep into it and allow them to eat off the grain before it is too far gone. This would save the money expended on raising it to that stage.

FULLER (C.). Locust Campaign, Cape Midlands, 1913. Agric. Jl. Union S. Africa, Pretoria, vii, no. 1, Jan. 1914, pp. 30-34.

During the early part of the year a few unimportant swarms of migratory locusts were reported from the Cape Midlands. It was found that two different locusts were involved, the true migratory locust, Locusta pardalina (Pachytylus sulcicollis), and a not particularly harmful species. L. danica. The farmers were urged to notify any egg deposits, and reports were received from between sixty and seventy farms. Till the 1st November there was every prospect of a successful issue of the campaign, but by this time it was obvious that the outbreak was far more serious than had been anticipated. Greater success might have been achieved had all concerned taken interest in the work. The locusts then coming to wing largely escaped the attack of locust birds, thus increasing the difficulty. Investigation also showed that the majority of locusts hatched from eggs deposited years previously. Complaints have been made that difficulty was experienced in obtaining poison, but in no case was a depôt further than fifteen miles from a locust-infested farm. The most serious fault has been found with the limited issue of poison arranged for; at first two drums were given to an applicant, but very soon the officers in charge were authorised to issue poison at their discretion. The meffectiveness of the poison was also a matter of complaint, but investigation showed that the solution had not been properly stirred and as a result a liquid under strength was used, leaving the heavier arsenic compound at the bottom of the drum. The farmers are again urged to co-operate with the Government and report every locust mevement.

La Protección a los pájaros útiles a la agricultura. [The protection of birds useful to agriculture.] -Revista agricola catalán de San Isidro, Barcelona, 1913, 69 pp.

This pamphlet is issued by the Provincial Board of Agriculture of Barcelona with the object of popularising bird protection, and stress is laid on the fact that the Chief Officer of the agricultural district of Catalonia reported in 1907 to the Board that the diseases affecting the "Algarroba" (carob bean) at Cambrils (Tarragona) could be avoided by bird protection. The value of reserves in ensuring the merease of birds forms the subject of one chapter, which contains the following figures from a paper presented in 1913 to the International Institute of Agriculture by the Hungarian delegate, M. E. de Miklos de Miklosvar, and dealing with the Hungarian State Preserves in 1911 and 1912. In 1911, the total number of nests was 5,005; of these, 2.677 (41 per cent.) were occupied by useful birds, 502 (10 per cent.) by sparrows, and 164 (3 per cent.) by animals other than birds. Thus it was estimated that some 14,000 useful birds would be bred that year. In 1912, 5,222 nests were inspected; 55 per cent. were found occupied and it was estimated that about 15,000 useful birds would be bred. The International Convention of 1902 is given in full. This

embodies lists of useful and harmful birds with the Latin and Spanish names. The Spanish law on the shooting of small birds is reprinted in extenso; this also contains a list of those species the killing of which is absolutely prohibited.

PHILBROOK (E. E.). The Brown-Tail and Gipsy Moths.—Qtrly. Bull.

Maine Dept. Agric., Augusta, xii, no. 4, Dec. 1913, pp. 1-10, 5 pls.

An historical account is given of the measures taken against the gipsy moth in the New England States. During the years 1907 to 1913 inclusive, the State of Maine has expended 170,000 dollars on the work of suppressing this insect. The eggs are laid on almost any object in July and August, in a mass of 400 to 500, covered with yellowish hairs. looking much like a small piece of sponge. They hatch about 1st May, and the caterpillars are full-grown by about midsummer. Sometime in July or early August they pass into the pupal stage, which lasts about 10 to 14 days. The caterpillars will attack any fruit, shade or woodland trees, and, where abundant, destroy all green vegetation. Coniferous trees are killed after being once defoliated and deciduous trees usually die after four or five defoliations. In the orchard the gipsy moth is readily controlled by painting the egg-masses with creosote in winter and spraying the trees with arsenate of lead (10 lb. to 100 gals, of water) just as the eggs are hatching in spring. Banding has also proved of much value in the work against the caterpillars. Spraying, thoroughly and carefully done according to the rules given by the best authorities, will almost always give good results. If carried out carelessly much damage may be done.

The brown-tail moth is the worst of the imported pests. The home of this insect is in Europe, where it occurs over the entire country. It deposits from 200 to 400 small eggs thickly covered with a mass of brown hairs. The large majority of eggs are laid on the under surface of shade and fruit trees. Those laid in July hatch the following month. and the young caterpillars, feeding in a mass, soon commence spinning their webs, in which they pass the winter. To check this pest the webs on shade and fruit trees should be cut off and burned in the autumn or winter. Fruit trees are best sprayed with arsenate of lead (4 lb. to 50 gals, of water) as soon as the eggs hatch in the late summer. Banding the trees with tanglefoot will in some cases protect the foliage from harm. The native birds are of great value to the orchardist and farmer, since many have been observed feeding on the caterpillars of the brown-tail moth. Prof. Fernald states that toads devour the caterpillars during early summer, and the moths later in the season. Numerous parasites have been bred from this insect.

BORNER (C.). Uber reblaus-anfallige und -immune Reben. [On the susceptibility and immunity of Vines to the attacks of the Vine Louse.] - Biol. Centralblatt, Leipzig, xxxiv, no. 1, 20th Jan. 1914, pp. 1-8.

The author gives an account of experiments made by himself in Villers l'Orme, near Metz, by M. Bichon in Pagny, s. Moselle, and by Professor Autelin in Nancy, on the resistance of different vines to the attacks of *Phylloxero*. The most important result of these experiments is to show that the effect produced upon vines by the Lorraine louse

was quite different from that produced by the South of France form. From this the author has concluded that there are two species of vine louse; he has called that found in Lorraine P. percastatrix. In the course of his experiments he proved that percustatrix could not adapt itself to certain vines. According to their behaviour when attacked by this louse, cultivated vines are divided into four groups: (1) Immune vines; (2) vines which are resistant, but which are subject to slight attacks; (3) vines whose leaves bear small, mostly sterile galls, but whose roots bear nodules and tubercles; they favour the development of the louse, but are to a certain extent resistant; (4) Susceptible vines, on which the normal galls are formed on the leaves and nodules on the roots, which favour the development of the louse and have no resistant power. The first class includes the following:-Pure strains of Vitis riparia, V. rubra and various hybrids such as riparia × rupestris, Condere 3306, 3309, Geisenheim 107; solonis riparia 1616a; Cabernet × rupestris 33a; cordifolia × rupestris, Geisenheim 19 and 20, etc. Immunity would appear to act as a Mendelian dominant and is transmitted when an immune species is crossed with one that is not immune; it is independent of outside factors such as temperature, moisture, season, and the food supply of the plant. The second class includes the following vines: - aramion rupestris, Ganzin Nr. 1; Mourvèdre × rupestris, 1202; riparia × Gamay, Oberlin 595 and 604, aramion × riparia, Teleky 143 B, etc. Vines of the third class are the hybrids riparia × rupestris 101 (Bouisset, Geisenheim, Löhnberg, Richtee), 175 (Geisenheim); riparia vinifera 44 (Laquenexy); solonis × vinifera 35 (Laquenexy); Madeleine royal x riparia 33 (Laquenexy). To the fourth class belong the majority of cultivated vines, particularly the European species of Vitis vinifera and silvestris, pure strains and hybrids of Vitis labrusca. the species of the American vines Vitis berlandieri, cordifolia and monticola, and many hybrids.

Tea mosquito.—Qtrly Jl. Scient. Dept. Ind. Tea Assoc., Calcutta, Part 4, 1913, pp. 98-99.

A funigating preparation known as sulphur-cake and produced in Hamburg is reported to have been highly successful against the tea mosquito (Helopeltis) in Java. When lighted, heavy funes penetrate into the tea bushes. In view of this, an experiment was made on the Leesh River Tea Estate, but the results obtained were very disappointing. At the time of this experiment the bugs were beginning to spread over the area, and the sulphur-cakes do not seem to have checked them, for three weeks later the Manager wrote:—"..., the plot we experimented on is just as bad as the rest. The sulphur had no effect upon it."

ANDREWS (E. A.). White ants.—Qtrly Jl. Scient. Dept. Ind. Tea. Assoc., Calcutta, Part. 4, 1913, pp. 96-97.

A "Universal" white ant machine was found effective on an old colony of a mound-building species of termite which was killing out a Gold Mohur tree. The nest was some five feet in diameter and about the same in depth, and the roots on one side of the tree were entirely

eaten away. The nozzle was pointed down one of the holes, all others being stopped up, and the fumes from four tablespoonfuls of the special compound were pumped in for about half an hour. The nest was opened three days afterwards. For some distance into it a deposit of sulphur showed insufficient combustion, due to lack of air. The upper combs, which were swarming with termites before the experiment, had been completely deserted. The fungus which was cultivated by the insects on the combs was entirely destroyed. Deeper into the nest the combs were full of dead soldiers, workers and young, but some of the nymphs were still alive. The ants have not reappeared, and the tree is doing well.

Andrews (E. A.). Shot-hole borer. Qtrly Jl. Scient. Dept. Ind. Tea Assoc., Calcutta, Part 4, 1913, pp. 94-95.

Xyleborus fornicatus, the shot-hole borer of tea, confines its attacks to the sap-wood. The female bores directly into the wood and excavates a vertical tunnel with side branches. At each junction are depo sited eggs, and the opening of the side branch is then covered up with a wad of damp saw-dust which produces the necessary conditions for the growth of the Ambrosia fungus, upon which the larva feeds. Its mouth parts are not adapted for chewing wood. The adult stays for some time in the larval gallery, which it lengthens, and in the case of small stems the sap-wood may be almost completely ringed. The chief damage is done by the tunnelling, which interferes with the flow of sap, and by the fungus, which ultimately causes the death of the tree. Dead, dving, or going-back trees are those attacked, and an examination of an infected bush will reveal some injury or disease. Pruning weakens the bushes and makes them more liable to attack. It has been suggested that various poisons, such as carbon bisulphide and benzene be poured into the holes; or that the stem of the bush he painted with some mixture, one of the most recent suggestions being a mixture of chalk and glue in equal parts diluted with water. A layer of this asphyxiates the insects in the galleries and obstructs the laying of eggs. By placing upright poles in the ground among the bushes, the insects may be induced to leave the latter alone, and bore into the former, which can be destroyed. An effective preventive measure is to leave a few shoots unpruned to regulate the flow of sap during the pruning season; and manuring. by making the woody tissues to grow more rapidly, tends to close up the tunnels, thus producing greater resisting power against the pest.

The use of Formalin for disinfecting tea seed. - Qtrly Jl. Scient. Dept. Ind. Tea Assoc., Calcutta, Part 4, 1913, p. 107.

As a result of experiments undertaken with the idea of ascertaining the value of formalin against mosquito blight, it was shown that the formalin damaged the bushes when its strength was less than halt that at which it killed the young bugs. This confirms the results of experiments made at University College, Cork, with formalin, against green ity and mealy bug, when "any efficacy formalin might possess as an insecticide was more than counterbalanced by its injurious action on the plants." [cf. this $Review \Lambda$, 1, p. 18.]

LOWERT (A. L.). Insect Pests of Truck and Garden Crops. -Oregon Agric. Coll., Corvallis., Bull. 91, (Exten. Ser. II, no. 5.) 1913, 39 pp., 13 figs

Frack-growing is followed on a commercial scale in limited areas of the zon, and the total amount of injury to truck and garden crops by heat pests is enormous. Having the crop in a clean, thrifty, growing medition is the initial step, and the use of insecticides is essential to the highest production of first-class truck and garden crops. To be dimost value sprays should be applied before the injury is apparent five careful rotation of crops; autumn, winter and early spring beginng; clean cultivation; care as to time of planting; the roper use of fertilisers; the use of trap crops; and the frequent examination of young plants for insect pests; these are all valuable measures.

Among general pests the cutworms (Noctudae) cause much bonage. As a control measure is suggested late summer, autuinn, or early spring ploughing, followed by frequent stirrings with the Carlow. By thus keeping down all vegetation the caterpillars are starved out. Poisoned bran mash is the standard remedy for cutvorms. This consists of 16 lb, of coarse bran, \(\frac{1}{2}\) lb. Paris green, \(\frac{1}{4}\) lb. silt and a quart of cheap syrup, mixed with warm water to make a warse crumbly mash, which should be spread broadcast over the held several days before the new crop is to appear. Small heaps of the mash may be placed about young plants, such as tomatoes, cabbages and melons. It is advisable to scatter the material in the evening so that it may remain moist for a longer time. Against grasshoppers ACRIDIDAE), the use of a disk-harrow or a renovator during late summer and autumn on grass lands adjacent to the truck fields would destroy many egg-capsules. The poisoned bran mash is as effective against grasshoppers as against cutworms, the former being especially fond of the salt in it. The tarnished plant bug (Lygus pratensis, Linn.) s a widespread pest. Many of these insects may be captured by sweeping over the plants frequently with an ordinary insect net. 1.7 per cent, kerosene solution is very effective against the nymphal forms. Cleaning up fence corners, etc., during the winter and keeping fown the weeds about the field are measures of special value for the outrol of this pest. The wireworms (Elateridae) cause injury by sating the germ of seed grain and excavating tunnels in potato tubers, and other seeds, bulbs and root crops often suffer in a similar manner Is control measures, plough in late summer and harrow the ground requently: rotate the crops, sowing the infested soil with a leguminous step for a season or two: on restricted areas poisoned baits of bran ish may be placed under stones or boards about the field. White males (Lacknosterna spp.) girdle large roots and completely eat off the caller ones, often killing the plant attacked. As a control measure, ough the soil to a good depth during the autumn, ordinarily from to 15th October will prove the best time. Crop rotation is of some App, and chickens trained to follow the plough will pick up many ads. Millepedes may cause much injury to garden and truck crops. The treatment recommended for wireworms should be of value. 1975 sings of a nitrate fertiliser, of salt or of rock lime, will probably be wild: and a soil dressing of 10 parts of sulphur and one part of

tobacco dust will repel them. Traps of sacking, boards, etc., as employed for slugs would be equally effective for this pest. The western potato flea-beetle (Epitrix subcrinita, Lec.) is the most serious pest of the potato and tomato in Oregon. The beetle eats small irregular holes in the leaf from the underside and these punctures induce the growth of a fungus. The larvae tunnel into the developing tubers underground and here also a fungus usually gains entranged The beetle avoids sprayed foliage. Bordeaux mixture applied for the potato fungus acts as a very effective repellent for the flea-beetle Arsenate of lead, 3 lb. to 50 gals, water, with the addition of 21 quart, of a good cane-syrup, is suggested as a spray. The under surface of the leaves must be thoroughly sprayed. Strips of paper suspended over the plants on a string stretched the length of the row are highly recormended by one grower. The stalk-borer (Papaipe nebris, Guentunnels into the stalks of potato and tomato, eating out the heart. As a control measure, cut out infested stalks and burn them The tomato worm (Chloridea obsoleta, F.), which burrows into the fruit, also attacks sweet corn. Direct hand methods are employed for its control. For the tomato aphis (Marcrosiphum lycopersus Clark), rarely occurring in injurious numbers, contact spraywould prove effective.

The bean Bruchus (Acanthoscelides obtectus, Sav) attacks the pods p the field and is also able to breed in the stored seed. The adult beetly deposits eggs in or on the pods in the field. The grubs hatch and burrow into the beans and are carried into storage. Weevily beanshould not be planted, because the grubs will continue development and infest the new crop. A temperature of 145° F, will kill the beetle at all stages and will not injure the germination of the seed. Fund gation with carbon-bisulphide is the standard treatment for store; grain pests. The pea Bruchus does not breed in stored seed, but the losses due to it are very heavy. The adult beetles deposit eggs on the forming pods; the grubs are mature at gathering time and paparin the stored pea. If the seed is held over a season in a tight bin, the beetles will emerge and die. Kerosene at the rate of 1 gallon to bushels of seed is recommended. Pour the liquid over the peas, sta thoroughly, then spread the peas out so that the oil may pass eff The treatment recommended for the bean Bruchus is equally efficacious for this pest. For the pea aphis (Macrosiphum pisi, Kalt.) keroses emulsion is possibly the best of contact sprays. The brush and cultivator method is used extensively on large commercial plantices in the south. The rows are planted sufficiently far apart to allow. single horse and cultivator to pass between. The insects are brushes from the vines during the heat of the day and the cultivator stirs the into the hot soil where they die. Another arrangement is a long shallow galvanised pan, which is drawn between the rows and the plant laare brushed into it. The pan should be filled with water and a the covering of oil added. Of the pests of the cabbage and radish cropin Oregon, Phorbia brassicae, Bouché, is the most serious. This insertals of feeds on the turnip, cauliflower, celery, rape and kale. They pass the winter as maggots and pupae in and about the roots of their food plants. The eggs hatch in from 4 to 10 days and the young maggetburrow at once into the tender plant. To check the pest gather and destroy all waste roots and refuse tops as soon as the crop is removed:

plough the land to a depth of 4 inches or more; destroy all wild mustard and similar weeds about the field; rotate the crops so that emericans plants occupy the soil for not more than one season; the use of a quick-acting fertiliser and frequent surface cultivation are decidedly beneficial. Screening of the cabbage seed-beds is highly peronamended by one authority. Five parts of sulphur to one part of tobacco dust, applied in the drill rows with the seed of radish and turnips gave good results. Lime and carbolic acid (1 gal, water, 3 table milk of lime, and I tablespoonful of crude carbolic) applied to the surface soil acts as a repellent for this pest; I pint of kerosene 50.3 gallons of sand is also recommended. Powdered tobacco placed about the plants at the time of planting and renewed every week has 1 roved useful. White hellebore, 1 part, and air-slaked lime, 10 parts, applied as a dust to the surface soil gives very good results as a preventive. Another serious cabbage pest is the cabbage aphis Ashes brassicae, L.). Contact sprays to be effective must actually not the insect and several applications are often necessary. Destroy allold stumps and leaves, since it is in these that the aphids pass the winter. If plants are infested in the seed bed they should be either apped at transplanting time or fumigated. Whale-oil soap, I lb. 66 8 gals, of water, makes a very effective dip and equally good is home-made fish-oil soap, the formula for which is caustic soda 14 lb.; water, 12 quarts; and fish-oil, 52 lb. For use, take 1 lb. of soap to 8 gals, of water, and dip only the infested parts. Infested plants dipped for 2 or 3 seconds in water heated to 122° F, showed that all the aphids were killed and the plants were uninjured. Kerosene emalsion as a 7 per cent, solution is possibly the best of aphis sprays, "Black Leaf 40," I part to 1,600 parts of water, with the addition of 11b, of whale-oil soap to 20 gals, of the solution has given excellent results. Diabrotica soror and D. trivittata attack cucumbers and melons and are also serious pests of beans, potatoes, turnips, etc. It is seldom that any one treatment will prove entirely effective. The "trap crop" nothod has given excellent results. Screens covered with cheeseand serve very well for the protection of small plants. Fine wire steen cones are also recommended. All old vines and trash in the field should be destroyed, as well as the wild gourd. For very small plants arsenicals as a dust should be used, and for older plants zinc atsenite, 1 lb. to 60 gals, of water, can be used as a spray. Lead arsenate paste, 3 lb. to 50 gals., is also good. The onion thrips (Thrips tabaci, lated) is becoming a serious pest in the onion districts. While onions enter most, cabbage and kale, cucumbers, tomatoes and several enamental plants are also subject to attack. The injury is due to a tasping of the surface of the leaf, which then wilts. "Black Leaf 40," 1 part to 1,600 parts of water, with the addition of whale-oil soap, tib. to 100 gals, of the solution, will control the thrips; kerosene emission as a 7 per cent. solution is equally good. The onion magget Populoju ceparum, Bouché) attacks the onion much as the cabbage Bagget attacks the radish, and similar control measures are effective for it. The paper concludes with a number of formulae for useful Esceticides.

Sahille (E.). Sobre el gusano de la peras y manzanas. [The pear and apple worm.] Revista de la Asociación Rural del Uruguay, Montevideo, Aug. Sept. 1913, pp. 359-362.

The author states that in Uruguay the moths of Cydia (Carpocapia; pomonella are best destroyed by bonfires lit in the evening around pear and apple trees when in blossom; or again, a large box provided with apertures, containing a light and smeared inside with honey of syrup, makes an effective trap. Against the grubs the author recommends preventive spraying. As Paris green is expensive, the use of Scheele's green (copper arsenate) is suggested. As a poison it is equal to Paris green, and costs only half the price; being in extremely fine powder it very easily remains in suspension in liquids.

JACK (R. W.). Two Ladybirds Injurious to Potato Plants.—Rhodesia Agric. Jl., Salisbury, xi, no. 1, Oct. 1913, pp. 77-82, 1 pl.

Ladybirds are in general of great value to farmers, constituting a powerful control against scale-insects and plant lice. There is, however, one genus of ladybirds, Epilachna, of which all the known species are exclusively plant-feeders. In Southern Rhodesia two species, E. dregei and E. hida, normally feeding on certain wild solanaceons plants, have caused serious damage to potato crops. The eggs arlaid in clumps, varying from four or five eggs to upwards of thirty, on the under surfaces of the leaves. Here the larvae hatch and feel on the softer portions of the leaves, as do also the adults. The latter live over the winter and probably egg-laying commences as soon as the warm weather approaches. It is probable that only two broods develop on the potato crop in Rhodesia, the first being laid in December, the adults appearing about the end of January; the second brood maturing early in March. If food is available in November three broods can doubtless mature. There is no doubt that potato diseases are spread and assisted by these insects.

Turkeys, when experienced in the work, are reported to be very effective in destroying this pest in the field. Much good can be deterby killing the beetles by hand. On a larger scale spraying with at arsenical compound is the most effective remedy. The arsenic may take the form of arsenate of lead, 3 lb, to 50 gals, of water; or Pass green 1 lb., quick or fresh water-slaked lime 2 lb., water 160 gals. or arsenite of lime, which is by far the cheapest arsenical spray ir Rhodesia, and as effective as the others. Arsenite of lime can be prepared from arsenite of soda and quick or water-slaked lime. The formula is, arsenite of soda 4 oz., lime 11 lb., and water 50 gallers The arsenite of soda is best dissolved in a little boiling water and madup to 25 gallons in one barrel. The lime is then slowly slaked and made up to 25 gallons in another barrel. The arsenite solution can not be added to the lime water and the whole stirred thoroughly. The lime solution should be strained. A hundred gallons of a mixture arsenate of lead to be effective costs 7s. 6d., while a hundred gallon of arsenite of lime costs only 8d. This latter mixture should be ker stirred during use.

Importation of Plants Regulations; Government Notice no. 259 of 1913, 21st Aug. 1913.—Rhodesia Agric. Jl., Salisbury, xi, no. 1, Oct. 1913, pp. 180-185.

The regulations made in this notice cancel previous regulations and apply generally to any plant imported into Southern Rhodesia. The regulations declare that any plant or packages of plants may be , varnined by an Inspector, and when deemed necessary as a pre-Lastionary measure against the introduction of any insect pest, may to treated by the Inspector at the expense of the consignee or addressee, an examination fee of 1s. per each class of plant included in a consegment will be charged, and 5s. for each use of the fumigating camber. If the Inspector considers it necessary, the package may be destroyed, no compensation being paid. After the examination a certificate will be issued for the package which must be produced at any time if required. One clause forbids the introduction into Southern Rhodesia of any plant from places outside British South Airica, except by post or through the port of Umtali or the ports proclaimed under section 8 of the "Agricultural Pests Act, 1911." No person may introduce into Southern Rhodesia from any place outside British South Africa any eucalyptus, acacia or coniferous plant or any living portion thereof with the exception of seeds; any stone-fruit tree or any living portion thereof which was grown or produced in any part of North America in which either of the diseases known as peach vellows or peach rosette exists; any live peach stones; any stonefruits in their fresh state; any stocks whatever except those of the following, which may be imported in bulk only, that is not less than 1.000 almond, pear, plum, persimmon, cherry, Northern Spy and other apple stocks accepted as being resistant to the attack of woolly aphis (Schizoneura lanigera). The introduction of grape vines or other plants of the family Vitaceae, sugar-cane, plants cultivated for the production of rubber, tea plants and coffee plants, shall be made under the direct supervision of the Government; this limitation shall not apply to the seeds or fruit, except those of coffee. Any flowering or mamental plant or any cotton seed may be introduced with special permission of the Director of Agriculture. The introduction for any one person shall be limited to 100 trees and 1,000 cuttings. Potatoes way not be introduced into Southern Rhodesia from outside British South Africa, unless duly certified and accompanied with particulars as to the place in which they were grown, etc.

MINTELLO (H.). Enfermedades del ciruelo. [Diseases of the plumtree.]—Gaceta Rural, Buenos Aires, xii, no. 76, Nov. 1913, pp. 333-337, 7 figs.

Prospis pentagona is one of the enemies of the plum-tree in the Arcentine and is best combated with lime-sulphur or "acaroina." Two applications are required during the winter, in May and in August, and in spring, spraying must be effected on the appearance of the larvae. The acaroina solution (10 to 15 parts of acaroina mixed in 100 parts water until emulsification takes place) is preferable to hime-sulphur because of its greater wetting power; it also kills the insect C20.

instantly. It is best applied in June, and spraying must be done on the same day as the emulsion is made in order to ensure uniformity. To control Scolytos ragalosus efficiently the parts attacked must be removed and burned; if the whole tree is infested it is best to root it up and burn it. Cydia funcbrana, commonly known as the plum worm, may be dealt with by gathering the fallen fruit and feeding them to pigs.

La falsa tiña de las colmenas. [The bee-moth.]—Gaceta Rural, Burpa, Aires, vii, no. 77, Dec. 1913, pp. 463-464.

The damage done by bee-moths increases with the heat and dryness of the breeding season. During the day they settle near the hives and at sunset fly round them; it is thus easy to collect or to net them. In 1902, bee-keepers in the district of Yerua lost 80 per cent. of their hives. If the trouble is severe it is best to remove the bees and fumigate the infested hives with sulphur.

NORRIS (F. DE DA MARE). Locust work in Selangor; Progress Report for October. Agric. Bull. Fed. Malay States, Knala Lumpur. 8, no. 5, Dec. 1913, pp. 124-125.

In the neighbourhood of Kajang the swarms were comparatively small and scattered, and the district was practically free from hopperby the 20th October. During the month of October approximately 465 kerosene tins of locusts, representing about 101 swarms, were destroyed. Around Kuala Lumpur the swarms were large, the apparatus being barely sufficient to cope with them. Considerable damage of a temporary character was done to gardens and hedge-By the 28th October few hoppers were present. The month's c tolwas 1,820 tins, representing 83 swarms in all. In the Ulu Selangor district swarms were large and in situations where they were difficult to dea with, but very satisfactory results were obtained and it is believed the locusts in this neighbourhood have received a check what materially decreases the possibility of their threatened advance into Perak. The chief centres of work were Rasa, Batang Kali, Bukit Cherdong, the Kuala Selangor road, and Serendah. By the end of the month the work was finished; the catch being 3,030 tins, representing is swarms. In addition to this work done by the Special Assistant and the Government coolies, the Malays caught approximately 12000 tins of hoppers for a reward of 1s. 2d. per tin, in this district. In a table showing the work done from 6th August to 31st October the total number of swarms dealt with in Ulu Selangor, Kuala Lumpur and Ulu Langat is given as 392, the total catch amounting to 24.756 kerosene tins.

NONELL V COMAS (J.). Las plagas de los Alcornocales en la Provincia de Gerona. [Cork tree pests in the Province of Gerona.]—Re-Inst. Agric. Catalán S. Isidro, Barcelona, lxii, no. 23, 5th Dec. 1913, pp. 355-358, and Monograph.

Lymantria dispar and Corochus undatus, the two most serious pests of cork plantations in Spain, have been studied by a commission

which visited first the plantations o' Romañá and other townships of the Selva and then proceeded to Darnius y Agullana on the frontier. In this article an address given by one member of the commission, Den Jaime Nonell y Comas, is freely quoted, while the Monograph contains a full record. L. dispar lays about 500 eggs in sheltered places on the branches and covers them with hairs from its abdomen, The eggs remain throughout the winter, and hatch in April and May, For 7 to 10 days the young caterpillars remain motionless, grouped together in large numbers; they then become active and extraadmarily voracious until the beginning of July, when they spin an imperfect cocoon in the rugosities of the bark. The adults emerge about three weeks later and shortly afterwards the females lay their eggs. The enormous voracity of the larvae is responsible for the rapid defoliation of the trees attacked, those preferred being he exergreen-oak, oak, cork-tree, plane-tree, and fig-tree. Corochus and the seedle of the family BUPRESTIDAE, appears between the middle of June and the middle of July. A few days afterwards the female lavs her eggs in cracks in the bark of the lower trunk and roots. The larvae bore inwards and establish themselves beneath the last-formed corky layer. After personal observation Señor Nonell v Comas does not agree with those agricultural entomologists who hold that the life-cycle of C. undatus lasts a year; according to him it lasts two years. In the second fortnight of August the larva penetrates the liber and provokes an extravasation of sap through its gallery. This causes a black spot on the exterior of the trunk. The discoloration may only be temporary, but if the flow is abundant the san spreads between the mother bank and that last formed and causes the latter to lose its good qualities. These spots were found to be a sure indication of the presence of the insect. It is hoped that the knowledge acquired may prove of use in reducing the ravages of these jests by leading to an encouragement of their natural enemies. Bird protection is an important point.

FEYTAUD (J.). La Cochenille de San José. [The San José Scale.]— Bull. Soc. Etude Vulg. Zool. Agric., Bordeaux, xii, no. 6, Dec. 1913, pp. 174-178, 2 figs.

Although the San José scale has not yet been found on trees in France, the author thinks it well to be on guard against this highly polyphagous pest. Fortunately Aspidious perniciosus has many natural enemies, such as the Coccinellids, Microvessa misella and Chdorous similis: the parasitic Hymenoptera, Aphelinus fuscipennis, A mylduspidis, Aspidiotiphagus citrinus, Anaphes gracilis, Prospulta ascenti. Ablerus elisiocampue, etc., and the fungus Sphoerostilbe ecosphila. Efficacious control methods are known, but they are authoust to apply to all the trees attacked. In the case of badly-adested and injured trees uprooting and burning is the only radical measure. The lime-sulphur formula given contains 5 parts by weight of quicklime. 3 of sulphur, and 100 of water. Hydrocyanic acid is mentioned as being very efficacious, but requiring costly apparatus and difficult to apply. Some Coccids native to France might be taken for A perniciosus. According to Dr. P. Marchal they are: (1) Aspidiotus ostreueformis, very common in France and abundant

on fruit trees near Paris; (2) Diaspis ostreaeformis, which is less frequent; (3) Mytilaspis pomorum, which may be very injurious to apple-trees,

Concorso per un rimedio contro le tignuole della vite. [Competition for a remedy against the vine moth.]-Riv. Vitic. Enol. Again. Conegliuno, xix, no. 23, 1st Dec. 1913, pp. 541-547.

The prize of £24 was competed for by four entrants, the application and results of whose methods were inspected by a jury composed of five experts, one being the representative of the Ministry of Agricultur-The first competitor used two ordinary soft clothes-brushes, one being held under the bunch of grapes which is lightly tapped and stroked with the other brush. Ninety per cent, of the larvae in the webs are wounded by the bristles and the webs disappear from the grapes, Two women can clean 1,700 vines in a 7~10 hours' day. Their labour costs 3s, 4d, per day at the rate of 1s, 8d, each, and the outlay for the

brushes is nominal, as the wear is insignificant.

The second competitor powders all the bunches with copper sulphase at a strength of 10 per cent., which he calls "Antisettico." application must be made in the second half of May. Its object is to keep the moths away from the grapes, thus preventing eggs from being laid on them. The succeeding treatment consists in dipping all the bunches marked with the webs of the vine moth into a glass containing an "antiseptic" solution invented by the competiter. This operation is performed after the flowers have been fertilised and immediately the corolla has fallen. Towards the end of July the powdering is repeated on the appearance of the moths of the second generation. A quart of the liquid, sufficient for about 1,100 vmes. costs about 11d, and it is non-poisonous. Including labour, the costs would amount to about 5s, when compared with the first method The cost of the powder is not included, for it contains sulphur and copper and thus serves also to combat peronospora and oidium. Our hour after immersion all the larvae were dead, and on inspecting the grapes some time afterwards these were found to be uninjured by the solution

The third competitor used lead arsenate, but instead of spraying he dipped the bunches in a 2 per cent, solution. This was done on the 8th June, when the larvae had appeared, but had not yet enclosed themselves in their webs. On 19th June the jury could find no trace of either larvae or webs on the vines treated, whereas both abounded on the untreated ones. To be effective the operation must be carried out on the first appearance of the first larvae. Using the same labour as before the comparative cost would be about 6s.

The fourth competitor employed a special powder called "Arxolea." which is supposed to be effective against peronospora, oidium, and the moths. No Bordeaux mixture or sulphur was used in the experimental plot, but its condition was found equal to that of vines treated with Bordeaux mixture and copper sulphate. As regards the point under investigation- the control of the vine moth- there appeared to be no difference whatever between treated and untreated vines.

The conclusions arrived at by the jury are as follows:-(1) The methods of the first two competitors are efficacious against the larvae of the first generation, but they cannot prevent these from damaging the flowers, because they can only be applied after flowering. The tree method appears cheaper and quicker than the second. (2) The method of the third competitor gives good results against the larvae if the first generation, provided it be applied at the proper time, that is, inform the larvae enclose themselves in their webs. Its disadvantage as however the poisonous nature of the liquid and the danger to which it exposes the user. (3) The "Arxolea" of the fourth competitor has neither a preventive nor a curative action on the moth. (4) None of these methods against the larvae of the first generation have influenced succeeding generations, and it may be assumed that in August the treated and untreated grapes were equally attacked. The prize was not awarded because no system can be efficacious unless it protects the young fruit as well as the flowers. It is suggested that the experiments be repeated on a larger scale next year, when any effect on the larvae of the second generation would be apparent.

Tarrov (V. E.). Изъ исторіи филлоксернаго вопроса въ связи со введеніємъ американской лозы въ Россіи. [History of the *Phyllocera* question in connection with the introduction of American vine-stocks into Russia.] Odessa (!), X.D., 18 pp.

The author reviews the history of Phylloxera in Europe, with special reference to the importation of American vine-stocks with a view to the production of Phylloxera-proof vines. As to Russia, Phylloxera was first discovered in 1880 in the western part of the south coast of the Crimea; in 1881 it appeared in Caucasia, in the vineyards near Suchum; and in 1886 it was also noticed in Bessarabia. It was established that both into Crimea and Bessarabia the pests were imported with vine-stocks obtained from Erfurt at the beginning of the 'seventies of last century. For a long time many Russian experts, principally Prof. A. O. Kovalevsky and I. A. Portchinsky, were amongst the opponents of the introduction of American vine-stocks into Russia, and they advocated radical remedies, aiming at the destruction of the pest; the Russian Government was also unfavourable to this new remedy, and it was only in 1892 that the official view on the subject underwent a change, and the prohibitions against the importation of foreign vine-stocks were gradually withdrawn.

In Bessarabia, where some years ago vineyards occupied an area of about 20,000 acres, more than one-third of them were suffering from Phyllocera in 1907. The first experiments with exotic stocks were started there about 15 years ago, and at the time of writing (?) is estimated that only about one-tenth of the vineyard area in that Government is attacked. In the Government of Cherson some 1,300 actes are affected by Phylloxera; the growing of American vines started only a very few years ago, although in one part they were estroduced in 1896. The Government of Taurida is still free from Phyllarem: American vines were introduced some 20 years ago, but some of the nurseries were afterwards abandoned. In Bessarabia and Cherson the Zemstvos assist the population by importing young stocks and distributing them amongst the vine-growers on easy terms, by securing the services of special vine instructors, by keeping experimental nurseries, etc. The author, who from the very beginning was an advocate of exotic vine-stocks as the best remedy against Phylloxera,

urges the necessity of their more extensive use, in order to save the vine-growing industry, especially in Bessarabia and Transcaucasia, from the losses caused by this pest. He also recommends the foundation of special schools for vine-growers, of vintage stations, etc.

MUNRO (J. W.). Tinea tedella, Cl., in Aberdeenshire.—Entomologisti Monthly Magazine, London, 2nd series, no. 289, Jan. 1914, p. 15.

The moth, Tinen tedella, Cl., is proving harmful to young spruce trees in Haylehead Woods, near Aberdeen. The larvae eats into the needles at the tips of the side-shoots and sometimes spins them together.

HILBERT (R.). Über das massenhafte Auftreten von Coccinella quinquepunctata, L. [Appearance of large numbers of Coccinella quinquepunctata.] Zeits. für wissen. Insektenbiologie, Berlin. x. no. 1, 20th Jan. 1914, p. 32.

The author records the finding of numbers of specimens of Coccinella quinqueponetata, L., in the autumn of 1912 along the Sämland Coast, and also on the banks of the Spiedingsee. The reason for the presence of the beetles in such large numbers in these situations is quite unaccountable, as weather conditions during the summer had been, so far as can be judged, unfavourable to insect life, and there was no evidence of a particularly abundant food supply. The author refers to Prof. Werner's records of the finding of similar numbers of Coccinella septemponetata and C. convergens [see this Review, Ser. A, i. 1913, p. 548].

TRÄGÄRDH (I.). Om lönnvecklaren (Tortrix forskaleana, L.) Meddelanden fran Centralanstaltens Entomologiska Avdelning, Uppsala, no. 15, 1914.

A review of the literature leads the author to the conclusion that the larva of T. forskaleana has been confounded with that of T. bergmanniana, probably owing to a misinterpretation of a statement of Boisduval. Of all authors dealing with this species only Wilkinson and Wallengren give a correct description of it, all the others quote the incorrect description of Bouché. From this mistake arose the statement that forskalcana attacks roses, which the author is inclined to disregard, as no one of the authors who give this food-plant appears to have a real knowledge of the larva. The food-plant is the maple the leaves of which are rolled by the larva. The life-history takes in the neighbourhood of Stockholm, the following course. The larvawere observed in the end of May, pupated the 10th of June, the first moths appearing the 8th of July; there is only one generation a year. the eggs, laid probably on the stalks or the keys, hatching in the beginning of August, the larvae feeding on the keys until autumn, when they hibernate somewhere until the middle of May of the following year, when they again curl the leaves.

This procedure is described and a detailed description is given of the larva, the pupa and the mode of pupation, with numerous figures Temerard (I). Krusbärskvalstret (Bryobia praetiosa, K.)—Meddelanden från Centralanstaltens Entomologiska Avdelning, Uppsala, no. 17, 1914.

A review of the literature regarding this mite leads the author to the following conclusions:—All the different species described by Koch, G. Canestrini and F. Fanzago, Berlese, Tjomas and Garman, under the names of practices, speciesa, nobilis, gloriosa, ribis and practices in must be referred to practices, K., being mere variations and different instars of that species.

The differences as regards the shape of the cephalothoracic plate and the hairs on the front femora, on which Berlese bases his two species, are not specific, but only variations, as proved by Oudemans and the author. The arguments which Thomas and v. Hanstein bring forward to show that ribis is different from practiosa, namely, that Koch mentions only 4 dorsal hairs on the latter, are not valid, because Koch in his diagnosis of nobilis distinctly states that the latter has the same three pairs of hairs as practiosa. Von Hanstein's argument that ribis is different from practiosa as described by Canestrini, because the latter author has found larvae and nymphae of practiosa as late as July, whereas the propagation in Germany takes place in April and May, is not valid, as Marlatt has shown that in the United States the breeding period is greatly influenced by latitude and climatic conditions,

B. practiosa is spread all over Europe, southwards as far as Egypt, northwards to the Arctic regions, and occurs in the United States. In Europe it is well known as occurring in moss, under stones, etc. but lately it has begun to attack gooseberries and has become a serious pest of them. In the United States, on the contrary, it is only recorded from several kinds of fruit trees and clover, but not from moss.

The cephalothoracic plate does not exist in the larva, which gives ir a likeness to the larva of Tetranychus, from which, however, it is easily separated by the different shape of the hairs of the body, those of Beyobia being flat and scale-like; in the first nympha (length 0.34 mm.) the plate is indicated by the lateral pair of the 4 anterior hairs being inserted on small prominences; in the second nympha dength 0:45 0:47 mm.) the plate is better developed, although still much smaller than in the adult. It is, in consequence, easy to distagaish between the different instars with the aid of the shape of the exphalothoracic plate. The hairs of the body are present in the same sumber and position in all instars- 4 pairs on the cephalothorax, 2 of m which in the second nympha and in the adult are inserted on the plate and 12 pairs on the abdomen; the hairs of the adult are broader than those of the larva and of the nymphae. Two pairs of eyes exist, contrary to Berlese's and Sorauer's statements; the tarsi are provided with two claws and between these an empodium provided with two dense rows of adhesive hairs; in the adult, however, the first tarsus has much weaker claws and greatly reduced empodium owing to the first pair of legs having developed into tactile organs.

The propagation of the gooseberry mite takes the same course in Sweden as it does in England and Germany; the eggs hibernate on the branches and in the beginning of May the larvae make their appearance, the greatest amount of damage being done in May and the begin-

ning of June; in the last weeks of June the eggs are laid and the adults

disappear.

The damage consists in the mites sucking the sap of the leaves, which results in the appearance of white patches, which become so numerous that often the whole leaf turns white and finally falls off, as do also the berries.

As a remedy, the author suggests the use of lime-sulphur spray against the eggs in early spring.

КСКИБІЛІМОУ (N. V.). Главнъйшія насъкомыя, вредящія зерновымъ злакамъ въ средней и южной Россіи. [The more important insects injurious to grain-crops in Middle and South Russia.]—Труды Полтавской С.-Х. Опытной Станціи. Отдъль сельско-хозяйственной энтомологіи. [Stadies from the Poltara Agricultural Experiment Station, No. 17. Department of Agricultural Entomobyy, No. VI.] Poltava, 1913, 119 pp, 49 figs., 7 col. plates.

In a short preface to his book the author points out that the absence in the Russian literature of a work devoted to insect pests of grain crops led him to undertake this task. The book deals only with insects injurious to standing crops, the pests of grain in warehouses and stores not being included.

The first chapter of the book consists of synoptical tables of identification of various insects according to the stage of the pests and the parts of plants injured by them; the tables contain (1) insects and their stages injurious to sown grains and roots of grain; (2) those injurious to sprouts of young plants; (3) those injurious to leaves and stems of plants in a more advanced stage of growth; and (4) insects and their stages injurious to grain in the ear. The author goes on to deal separately with various orders of insects, starting with Orthoptera, and describes the habits of the following ACRIDIDAE: Locusta (Pachytylus) migratorius, L., L. danica, L., Caliptamus italiens. L., Oedaleus n grofasciatus, de G., and Stauronotus moroccanus, Thunb. He then passes to the remedies against them; ploughing in autumn to destroy the egg-masses, insecticides (which he considers to be the most important remedy against the larvae), poisened food, hopperdozers, crushing, burning, and driving into trenches. He further deals in the same way with Gryllotalpa gryllotalpa, L., and devotes the third chapter of his book to various species of Thrips. Limothrips denticornis, Hal. (Thrips seculina, Lind.), a description of which is given, occurs on rye; it winters in the imago stage on wild grasses. but only the female survives, the male perishing during the summer. The injury done by the larva and imago is described, but the author is unable to suggest any remedies, as the reploughing or burning of the stubble would prove of no use, owing to the absence of the inserts from the latter in autumn and winter. Stenothrips graminum, Uzel. is usually found in oat fields; the author suggests as a preventive not to sow early oats, these being also less productive. This species winters as a larva deep in the earth; therefore ploughing in the stubble would not be effective. Haplothrips aculeata, F. (Thrips frumentarius, Beling), is often mistaken for H. tritici, Kurdjumov; the insect winters in the imago stage and attacks rye-crops early in the spring; only the females hibernate. Early in July the first generation migrates to maize, on which a second generation is produced. Haplothrips tritici, Kurdj., is the most important and injurious species in these parts of Russia. It winters in the larval stage in the earth of on wheat stubbles, and these larvae do not become mature until about a month after their appearance in the first half of May. The imago flies first on to rye, passing afterwards on to wheat, both winterand summer-sown, where oviposition takes place. The injuries caused by this pest are very serious, owing to its great numbers; in 1912 it was impossible to find grains of wheat which had not either been injured by the insects or did not contain a larva. As remedies, the burning of the stubbles is recommended, from which good results are expected, judging by the experiments conducted at the Poltava Experimental Station in 1911; the reploughing or scarifying of the stubbles in July is also effective, as after these operations the moisture of the soil is greater, thus favouring the development of the fungus, Borntis bassiana, Bals., which attacks these pests.

The author further describes the life-history, the injury done by, and the control measures against the following bugs: "Euryguster integriceps, 18th., E. maura, L., and E. austriaca, Schr., Aelia acuminata, L., and two species of Miraria. He goes on to describe various Aphids injurious to grain crops, giving a synoptical table for their identification. The following species are dealt with: "Macrosiphum granarium, Kirby (Siphonophora cerealis, Kalt.), Toxoptera graminum, Rond., Brochgeolus noxius, Mordw. (karotnevi, auct.), Sipha maydis, Pass., Aphis pudi, F., A. arenae, F., A. euonymi, F., Anoecia corni, F., Tetranara ulmi, de G., T. rubra, Licht., Pentaphis trivialis, Pass., P. margonta, Koch, P. setariae, Pass., and Paraeleulus cimiciformis, Heyd.

In dealing with Lepidoptera the author devotes most of his attention to Euxoa (Agrotis) segetum, Schiff., and next to Oria (Tapinostola) wascalosa, Hb. (frumentalis, Lind.) and Trachea (Hadena) basilinea, L. Oral musculosa is one of the chief pests of grain crops in North Caucasia, in the province of Don and in the Governments of Taurida, therson, and Ekaterinoslav. The insects are on the wing during June and July and oviposit on young shoots, also on weeds and stubbles, each female depositing up to about 200 eggs. The eggs remain over the winter, the caterpillars appearing at the end of April and boring anto the stems, where they develop. The larvae pupate in the earth during the first half of July, the image emerging in about a fortnight. The plants most injured by these insects are wheat, both summersown and winter-sown, barley and oats; they do not touch maize. The remedies suggested are the burning of the stubbles, the mowing and burning of weeds round the fields, and the reploughing in autumn of the attacked fields to a depth of about 7-8 inches, also the rotation of crops, including the cultivation of such plants as maize, beet and lectators, which are not injured by the pests. Besides these most marious moths, the author deals also with Feltia (Agrotis) exclamatumis, L., Euxoa (Agrotis) tritici, L., Hydroccia nictitans, L., Phlyctacredes sticticalis, L., Pyrausta (Botys) nubilalis, Hb., Crambus luteolus, Schiff. C. jucundellus, H.S., and Öchsenheimeria taurella, Schiff.

The sixth chapter is devoted to Coleoptera, chief amongst which must he placed Pentodon idiota, Hbst., Anisoplia austriaca, Hbst., Agriotes intentas, L., Lema melanopa, L., all of which are very fully discussed. An

account is also given of Zabrus tenebriodes, Goeze, Ophonus (Pardileus) calceatus, Duft., Melolontha melolontha, L., M. hippocastani, F., Amphi. malus solstitialis, L., Anisoplia cyathigera, Scop., A. segetum, Hist. Tropinota hirtella, L., Athous niger, L., (more common and injurious in the south of Russia than Agriotes lineatus), Opatrum sabulosum, I. Pedinus femoralis, L. (the last two species injure tobacco and maize). Dorcadion carinatum, Pall., Lema cyanella, L., Chaetocnema aridula Gyll, and Phyllotreta vittula, Redt. The larvae of Chaetocnema aridula, Gyl., are found in the governments of Poltava, Charkov and Tula, and probably also in many others; they winter in the imago stage and appear in the fields early in spring, ovipositing on the dead parts of plants, close to the earth; the larvae live inside the stems of rye, wheat, barley and oats, but the greatest damage is done to summer wheat and to barley; the second brood appears in the middle of July. Dry weather favours the injurious activities of this pest; as a remedy early ploughing of the stubble is recommended.

The author then proceeds to describe the dipterous insect pests:-Mayetolia destructor, Say, to which special attention is paid; M. arenae, Marchal, which has not been previously recorded as a pest in Russia; Lasioptera cerealis, Lind.; Contarinia tritici, Kirby, which is seldom injurious in Russia; Oscinella frit, L., with which the author again deals very exhaustively. The last-named insect flies from the beginning of May, the average duration of life in nature being 2-3 months; the number of generations may be three or four during one summer, although the author is of opinion that in the latitude of Poltava there is only one generation. The insects may be found till the middle of October, the greatest damage being done to summersown crops, the winter crops being able to recover from their injuries during the long autumn. As to remedies, the author approves of the late sowing of winter crops, deep early ploughing, early scarifying of the stubbles, and strongly recommends the destruction of fallen crops; he points out that every prolongation of the period of growth of summer-sown crops increases the percentage of their infection by this insect, and that those sorts of summer crops which tiller less and come into ear earlier are better able to withstand the attacks of the pests: while winter crops recover by their tillering early in spring and late in autumn, summer crops by the same tillering increase their chances of infection. Other flies mentioned are Chloropus toeniopus, Mg., which produces two generations yearly, and sometimes does considerable damage to crops, especially if winter-sown; Meromyza saltatris. L. which is not very injurious; Hylemyia (Leptohylemyia) coarctata. Fall, the damage done by which is specially noticeable in spring on winter wheat and rve; Hydrellia griscola, Fall., reported from Crimea. and from so far North as the governments of Moscow and Kurland. injures chiefly late-sown barley; and Domomuza nigripes, Zett., which injures mostly leaves of winter wheat, although the damage is not

The last chapter of the book contains the descriptions of some Hymenoptera, the most important of which are the sawflies, Cephus pygmens, L., Astatus niger, Harr. (troglodytes, F.), found in middle Russia on rve, and Truchelus tabidus, F., from south Russia. The author describes the habits of and remedies for C. pygmens, and is of opinion that the method of harrowing out and burning of the stubble.

after the land has been scarified, is ineffective; he gives a table summaresults of some experiments conducted at the Station in Potava,in 1912, from which it appears that after the harrowing has been thrice repeated only 52 per cent, of the stubble has been thrown As to the burning, the author is of opinion that this remedy can to applied on winter-sown fields, especially when this is done early in taly and in dry years. He does not think that an earlier harvest can be considered a remedy, as the insects usually leave the crops much before they can be harvested. The deep ploughing of the stubble seems to be the best remedy, as is shown by some experiments at the Station, which, however, are not quite completed. Isosoma noxiale, Portch., in some years attacks up to 80 per cent, of the stems, although the actual damage is less than it appears, as it has been shown by some experiments at the Poltava Station that the loss to the weight of grain in the attacked stem is 10 per cent, and less. This species has only one generation, the larvae remaining over the winter inside the stems, so that the greater part of them is taken home after the harvest; the thrashing of the crops does not usually destroy the insects, unless a straw press is used, and the author recommends using the straw of winter wheat as fuel or as litter during the winter months; where long stubble is left in the fields it should be burned off. Isosoma grant, Fitch (Isosoma hordei, Harr.), is very injurious in the governments of Cherson and Ekaterinoslay.

The descriptions of most of the pests given in the book are accompanied by figures of their various stages, plants injured by them, etc, V-supplement deals with the Tarsonemid mite, *Pedicolopsis graminom*, E. Renter.—The work constitutes a most useful book of reference on the subject.

Di. CASTRO SOBRINHO (A. R.). A Batata Inglésa e a sua Cultura. [The English Potato and its Cultivation.] Boletim do Minis, du Agric, Indust. e Comm., Servico de Informações e Divulgação, Rio de Janeiro, 1913, i, no. 5 (Nov.-Dec. 1912), 1913, pp. 74-83. [Received 16th Jan. 1914.]

In this pamphlet, which deals with the general cultivation of the potato in Brazil, the author says that the following insect pests of the plant are known: The potato beetle (Leptinotarsa decendimenta), which can be kept down by copper sulphate sprays; a hawk-moth Aberontia atropos), the larva of which is one of the worst enemies of which is known as "bicho pardo" and devours the lower parts of the plant; and an aphis, which may be destroyed by dusting with line of plaster of Paris.

BONDAR (G.). Brocas das Laranjeiras e outras Auranciaceas. [Borers of orange trees and other Aurantiaceac.]—Boletim do Minist. da Agric. Indust. e Comm., Serviço de Informações e Divulgação, Rio de Janeiro, ii, no. 3, May-July 1913, pp. 81-93, 15 figs.

The author says that the most important citrus borers in Brazil are Acrocinus accentifer, Diploschema rotundicolle and Cratosomus tedi. In addition to these, C. Moreira has met with a Cerambycid, Rhopalophora collaris, Germ., and H. von Ihering records Trachyderes

succinctus, though these are by no means common. The large Longicorn beetle, Acrocinus accentifer, Oliv., is generally distributed in Brazil and the damage done by it is very serious. In three or four years it is capable of completely destroying a citrus plantation; the destruction of the trais certain, unless immediate preventive measures are taken. insects lay their eggs in spring and summer, by preference at the basof the trunk, boring holes for the purpose with their mandibles. Tilarval stage lasts for about a year, and pupation takes place between July and September, the beetles emerging from August to October and sometimes later. The beetle flies but little, and does not propagate rapidly, and the author thinks that this is the explanation of the fact that sound and bored trees are constantly found close together. The insect is common in the bush and does similar damage to the white cedar (Cedrela brasiliensis) and to certain other trees of different families. The best time for killing the borer is in the months of May and June. The lower parts of the trunks of the trees should be carefully examined and the burrows should be opened up; a little bisulphide of carbon is then injected into the hole with a syringe, and the hole immediately stopped with a plug. This process will kill the lava, pupa or perfect insect. Benzine or gasoline will also answer the

purpose.

Diploschema rotundicolle, Serv., another Longicorn, attacks orange, mexeriqueiras (Citrus deliciosa, R.), and lemon trees. The damage is somewhat different from that done by the previous insect. The eggs are laid from December till April in minute incisions at the extremities of the branches. The larva bores downwards through the larger branches to the trunk, and the burrows never communicate with one another. Sometimes the trunk is riddled through its whole thickness. and the author says he has seen the trunk of a lemon tree which contained 16 such burrows. The length of the burrow may be as much as 7 to 10 feet. The active condition of the larva lasts approximately 8 months. When growth is completed the larva turns and mounts upwards, enlarging a portion of the burrow into a chamber and making an elliptical orifice 1/2 inch in diameter for the exit of the perfect insect. This orifice can be easily distinguished from the exit holes for frass made during growth, as it is of larger diameter. Below this opening the larva blocks the burrow, forming a chamber 3 to 5 inches in length, in which it is protected from the attack of ants. etc., in the last period of its development. This chamber is made in the spring at the beginning of the second year of larval life. The pupal stage, according to A. Sampaio, occupies 71 days. The author goes into considerable detail as to the manner in which the burrows are formed and their varieties, and gives a number of figures and photographs. Occasionally the larva makes horizontal burrous. which the author explains as a provision against its being crushed by the natural growth of the stem and by the cicatrisation of the wounds made. He says that this insect damages peach trees in a similar manner, and that in the bush it is frequently to be found on a Euphorbiaceous tree (Croton foribundus) locally known as "tapichingui. The treatment consists in inspecting the trees in the months of May and June, searching for frass, and, as the larva has not yet descended into the trunk, cutting off the ends of the small branches. It is then easy to destroy any larva which may have descended towards the trunk or into an important branch. All the lateral holes for the extrusion of frass should be plugged with wax or clay, and then bisulphide of carbon injected, as in the previous case, into the terminal opening of the burrow. A. Sampaio, after careful study of trees throughout the carbon to the specially from November to May, says that the female lays the roggs on new and tender branches in the axils of the leaves. Hatches takes place in from a few days to a few weeks, and it will be seen that the buds and young leaves begin to wither; this, he says, is althout proof of the presence of the pest, and if this fading of the leaves and buds be carefully watched for, the damage can be stopped almost immediately by cutting off the tip of the branch or twig.

Codosomus reidi, Kirby, is a large weevil, the larva of which causes very serious damage to orange trees and mexeriqueiras (Citrus delicool, R.). In several orchards in Campinas this beetle is very abundant, and it is quite a common thing to find from 3 to 10 individuals at work on one tree. The author says that so far no mention has been made of this insect in the agricultural literature of Brazil, in spite of its being so widespread and destructive. He gives the following particulars as to its bionomics. The eggs are laid separately in the spring, in ones and twos, in small holes made in the bark of the tree. The trunks are attacked from the base as far as the branches, and holes bave also been found on roots projecting above the soil. As soon as batched the larva begins to bore into the wood, for some time in a horizontal direction. The frass has the appearance of little balls about 15 mm. in diameter, consisting largely of the excrement of the larva. During the first period of development, which lasts for about a year, it is not difficult to discover the borer by means of this characteristic frass upon the ground. In the second year the frass blocks up the hole as if with ribbons of wood, giving characteristic evidence of the presence of the borer, of which there is no other external indication. Sometimes the burrow is superficial, following the bark, and sometimes it is at a depth of 1 to 4 inches. The author has found trunks bored through their whole thickness, and there is a specimen in the Instituto Agronomico containing seven parallel bore-holes made by different insects. In the case of mexeriqueiras, it frequently happens that the trunks or branches are bored to such an extent that they are broken off by the wind. Old bore-holes, from which the frass has been removed by ants, may be confounded at first sight with those made by Diploswho not robundicolle, but a slight examination will show the difference. The holes made by Diploschema are straight and of uniform diameter, and the walls are marked by transverse incisions made by the mandibles. The bore-holes of Cratosomus are generally much larger, simuous, of variable diameter, and the walls are smooth.

The development of the insect requires two years. Pupation takes place during August and September; the perfect insect is produced an September or October, and emerges in October, November or December. The exit opening attracts attention by its extraordinary size. It is not at all uncommon to find holes of 15 to 17 mm. in diameter in the trunks of orange trees. These holes are found at various heights above the ground, but generally from 50 cm. to 1 metre up the trunk. For a long time it was supposed that these holes were made by Diploschema, but careful study showed that this was not the case, and it is now possible to distinguish the attack of the two

insects. The exit hole of Cratosomus is round and the bore is inclined upwards, whilst that of Diploschema is elliptical, 13–14 mm. across and 9–10 mm. vertically. A new hole indicates that the larva has formed its chamber for the pupal stage, which lasts about a year. The total length of the burrow of Cratosomus is 60–70 cm., the diameter being 12–20 mm. It is easy to understand that damage of this kind has a very serious effect upon the trees; one borer alone may endanger the life of a tree. The author describes the larva, nymph and perfect insect, and says that the species is peculiar to Brazil. Nothing is at present known of the indigenous plants on which it feeds.

The remedy, the author says, is simple during the first year of bonner when the frass on the earth reveals the presence of the pest. The opening is slightly enlarged with a boring tool, so as to admit the nozz'e of a syringe, and 2 or 3 cc. of bisulphide of carbon are injected the hole being immediately plugged with wax or clay; the best time to do this is either in May or October. Borers in their second year should be treated in September, when the exit hole has not been opened externally. It is possible, by carefully examining the trunks to find the position of these holes, the bark over them being dry and split and frequently covered with a gummy moisture. All that is necessary is to remove the bark on this spot and introduce a piece of wood of suitable size and drive it tightly into the hole. The perfect insect then remains imprisoned and dies. The best prophylactic is orchards in which this borer makes its appearance is that used against Acrocinus accentifer, that is, to smear the trunks with a substance which drives away the insects and prevents them from laying their eggs. The author gives the following formula: - Crude carbolineum, I part; quicklime, 10 parts; water, 40 parts. The lime is first dissolved in a little water, the rest is then added and then the carbolineum is well stirred in. The insect does not fly with ease, and once destroyed, the author thinks that very little trouble will be required to preserve an orchard against further attack. The paper is exceedingly well illustrated with diagrams and photographs showing the method of attack peculiar to each of these borers.

HIERING (R. Von). Em defeza do "Tico-Tico." [In defence of the "Tico-Tico" (Brachyspiza capensis).] - Chacaras e Quintus. S. Paulo, viii, no. 4, Oct. 1913, pp. 47-49, 1 fig.

The author says that this bird, formerly known as Zonotricker pileata, should be protected in Brazil. From experiments made by himself and still in progress, he has found that each bird consumes daily, on an average, 120 insects, either as adults or larvae. He further calculates that in his own garden of about 7 acres, in which a colony of 10 Tico-Ticos have established themselves, these birds eat close upon 5,000 insects and larvae daily.

POSKIN (J.) Rapport sur les observations effectuées en 1912. [Report on the observations made in 1912.]—Ann. Sta. Agronom. de l'Ebit. Gembloux, Bruxelles, ii. 1913, pp. 353-366.

Among cereals, Tylenchus devastator, Oscinis frit and Zabrus gilbus have been reported, but they occur only in isolated areas and do not cause serious damage. Sugar-beet has been severely attacked by

Aphie papareris in certain localities. Cassida nebulosa and C. oblonga, pests of the beet, well-known but fortunately rare in Belgium, are catable of causing considerable havoc; arsenical spraying appeared to be effectual against them.

Among Aphids, Hydlopterus pruni, Myzus ribis and M. cerasi have severely attacked various fruit trees. Aphis mali was abnormally abundant, causing much damage to apple trees. Eriosoma (Schizomany banigerum also continues to spread. The pest limits itself to the more superficial roots, and on this account winter treatment is preferable. The destruction of the infected roots or the sulphuring of the soil around the trees is far more effective than washing the trunk and branches with soapy water. The British Board of Agricultate recommends strongly the use of calcium carbide, which in the steamer of water gives off acetylene. Pieces of the carbide are introjuced into holes in the earth around the tree, which should then be closed immediately. If the earth is very damp, in order to prevent too tabled decomposition, the pieces of carbide can be folded in paper. The difficulty of summer treatment is in finding a suitable method of applying the insecticides. M. Ritzema-Bos is of the opinion that no really efficacious method of dealing with this insect exists; after each treatment a few survive and these rapidly increase.

the the regarding have also been made on forest trees. It has been specially noted that much damage has been wrought among the oaks in Belgium, and it will probably become a question as to whether they should not be excluded from the forests. The pest attacking the oak in the region of Valenciennes is a Buprestid beetle, Agrilus biguitatus, F. In the forest of Raismes there was great mortality among the trees. In 1881 Altum noted that this Buprestid was rather common in the district of Eberswalde: it is also mentioned by Judeich and Nitsche and by Nüsslin. Checking the pest is unfortunately difficult, except by destruction of the infested trees. Agrilus viridis, so far as is known, is limited to the forest of Raismes.

Postelov (V.) Свекловичный долгоносикъ и мѣры борьбы съ нимъ. [Bothynoderes punctiventris, Germ., and methods of fighting it.]—An Agricultural Monograph published by Главнов Управлене Землеустройства и Земледѣлія, Департаментъ Земледѣлія. [Central Board of Land Administration and Agriculture. Department of Agriculture.] St. Petersburg, 1913, 2nd Edition. 116 pp., 8 figs, 3 tables.

Behavederes princtiventris, Germ., is one of the most permanent and schools pests of sugar-beet, and is found from Austria-Hungary to barcasia and the southern part of Siberia (Dauria). Within these areas it is to be found wherever beet is grown, but in some places its revelopment is checked by certain meteorological local conditions, as, for example, in the governments of Kursk, Tambov, Samara and Voronezh, and in Russian Poland; but in the governments of Kiev, Podolia, Charkov and some other parts of south-western Russia its power of multiplication is very considerable. It was in the district of Policinia, in the government of Kiev, "the cradle of the Russian sugar-beet industry," that its injurious activity was first noticed in 1851; in the middle of the 'eighties of last century it was first observed

in Hungary, thence spreading to Austria, Moravia and south-eastern Germany. The author gives a list of 25 species of Curculion_{DAR} which he has observed from 1903 to 1905 in beet plantations in Kiev, of which 14 species are recorded for the first time from beet (pp. 12-14). He has not found Leucosomus pedestris, Poda (ophthalmicus, Rossi) or Psalidium maxillosum, F., though these have been reported by other authors; he also gives some information as to the habits of some of these pests.

B. punctiventris winters in the imago stage, the beetles remaining beneath the earth after their emergence from the pupa in the autumn Only a very small percentage (1-4 per cent.) winter in the pupal stage, and a considerable proportion of these perish during the winter. In spring the insects appear, and the resulting larvae pupatin July, so that there is normally only one generation in the year.

Outside beet-plantations there is very little food for these insects as their wild food-plants are only Atriplex and Chenopodium; they do not touch, even when starving in captivity, either Artemisia, Plantago, vetches, or any other papilionaceous plant; the damage done by them to beet is therefore the more serious, once they get onto a plantation, especially if they arrive there at the moment when the sprouts just appear. In that case they attack the cotyledons and bite through the shoots. When the second pair of leaves appears, the sprouts are better able to withstand the attacks of the insects, which then cat round the leaves, but are not able to gnaw through the whole plant.

The female is able to lay 1-6 eggs daily; the total number of eggs laid by 3 females in captivity was 82, 84 and 110 respectively. The inserts apparently prefer friable surfaces for oviposition. As to the duration of the life of the inserts, specimens are often found which live three months and more, the male usually living the longer; one male was kept alive for 6 months.

The author further describes very fully the egg, the larva, its moulting stages, the process of moulting, the pronympha and the pupa of B. punctiventris. According to his experiments the development of the larva inside the egg lasts 10-11 days, the larval stage occupies somewhat less than two months (48, 49, 51 days) the pronymphal stage about 5 days, and the pupal stage about 13-16 days. The larvae feed on the roots and the direct damage done by them does not appear to be very great, causing the death of the plants only when accompanied by drought; but the effect upon the sugar production is considerable.

The author goes on to deal with the conditions favouring and checking the development of *B. punctiventris*. The weather conditions influence the oviposition and consequently also the number of egglaid; the development of the larvae also depends on the meteorological conditions, as they require a moderate amount of moisture in the soil; abundant moisture provokes various fungus diseases, while drought causes the larvae to pass deeper into the earth, where they find no food, and dwarfed pupae are produced. Extensive drought also provokes red muscardine (Sorosporella uvella, Krass.). The weather conditions influence also the hibernation of the imago, a rainy autumn and a winter with little snow and frequent thaws causing the death of many beetles.

As to the insect enemies of B. punctiventris, no parasites are known to exist. The following are amongst the enemies of this insect from the animal world:—(1) ants; (2) various beetles of the family Caratana Private: Poecilus cupreus, L., P. punctatus, Schall., Pterostichus melas, Creatz, Amara apricaria, Payk., Ophonus pubescens, Müll., O. griseus, Pr. O. calceatus, Duft., and Harpalus psittaceus, Fourc., all of which, both in their adult and larval stages, destroy the larvae and pupae of B. punctiventris; (3) another beetle, Hister finetarius, Ilbst.; (4) kinks such as rooks (Coreus frugilegus) and some species of bustards. In the stomach of a rook, examined by Terestchenko on the evening of 20th April 1905 (the first warm day when the beetles started leaving their holes), there were found 133 proboscides of B. punctiventris, 1 undamaged specimen of Poecilus cupreus, 2 specimens of Hister sp., and 13 wheat grains; (5) some parasitic worms of the genus Mermis and microscopic Ascaridae.

The activity of all these animal enemies of B. punctiventris is, however, insufficient to check its multiplication. A more important part is played in the destruction of this pest by various parasitic fungi, which provoke the muscardine disease amongst the larvae, pupae and amagines, from 20 to 80 per cent, perishing from this disease in different years, it being more prevalent in the years in which the weevils are most numerous. The author deals very fully with the various forms of this disease and with the many experiments which have been undertaken in order to infect the pests with it. He describes the "green muscardine," so called by Metchnikov, produced by the fungi thespara destructor, Metchn., Entomophthora anisophiae, Metchn., and Form distructor. Metchin, and the "red imiscardine" produced by Somsporella wella; both these diseases attack all the stages of the heetle, except the egg. There is also a "white muscardine" provoked by the fungus Botrytis bassiana, which, according to Krassiltchik, attacks the imago of B. punctiventris, while he was not able to detect it on the larvae or pupae of this insect. Attempts were made at Smiela, by Krassiltchik in 1884 and by Danysz in 1900, to disseminate these diseases artificially, but without success. Toporkov, in discussing these experiments, has suggested that only green muscardine should be used, as the white form does not develop well in the soil of the government of Kiev; and he further recommended that the infection should be induced by sowing the spores of museardine in the earth together with the seeds of beetroots, for which purpose the seeds must be covered with a powder of the spores, about 10 lb. of the latter being used for approximately 11 cwt. of seeds. However, the experiments undertaken by Toporkov failed, as did also some other experiments at the Station in Smiela. The author urges the necessity of further investigations, in such a direction as to show which micro-organisms and which of their stages are active destroyers of the larvae of B. punctiventris; what are the natural conditions favouring the spread of the disease; how long the micro-organisms retain their activity; and how deep they must be buried in the earth. With regard to the first of these questions the author refers to the work of P. Buchner on Symbions ("Studien an intracellularen Symbionten," Arch. f. Protistenkunde, xxvi, 1912) and suggests that probably Oospora destructor is a symbion, producing mycelium only in larvae living in unfavourable conditions. The author has also found some diseased larvae from which he obtained examples of Bacillus bombycis, the number of larvae suffering from this disease (flacherie) being considerable in the wet summer of 1903.

Coming to the remedies the author divides them into two groupsmechanical remedies, more or less connected with the methods of soil cultivation, and chemical remedies. In order to destroy the eggs which have been laid in the spaces between the rows, and also the larvae, he suggests hoeing the surface so as to make the soil friable and gives a table showing the satisfactory results of this method In order to destroy the wintering specimens autumn ploughing of the fields to a depth of 8-10 inches is recommended, thus exposing the beetles to the weather. The author is also of opinion that the fields ought to be left fallow instead of using them, as is now done, for summer crops; he further recommends the use of mineral manure, and a reduction in the size of the plots so that they can be better protected by surrounding trenches. These trap trenches usually have a width and depth of 14 inches, with smooth walls, that next to the plot having an inclination of 30°; along the bottom of the trench holes about 8-9 inches deep are made at intervals. The beetles that are trapped must be collected daily and destroyed by burning or with boiling water. In order to facilitate the detention of the beetles the use of various sticky substances is recommended; these should be smeared over straw, which is put into the holes in the trenches, and sticky strings may be placed along the channels. The best material is Tro-Tanglefoot, but the author gives also a recipe for an adhesive, which he recommended in 1904. About 7 lb. of crude naphtha is heated to the boiling point, after which about 8 lb. of resin is gradually added. This adhesive is most effective at a temperature of 20° R (77° F.); in the sun at a higher temperature it melts, so that the proportion must be altered to one of 8 lb. of resin to 6 lb. of crude naphtha. This mixture can also be smeared over small boards, which are put into the trench. The use of small tin vessels sunk in the floor of the trench is also recommended, as they require less attention, and when full can be easily emptied and replaced. All these practical matters are dealt with in detail by the author and are accompanied and illustrated by various tables and figures.

An account is then given of sprayers of different kinds which can be used either on special trap zones or over the whole plantation. These zones are useful so long as the insects move on foot, but must be abundantly sprayed with strong insecticides; later on it is necessary to spray the whole of the plantation. Barium chloride and Schweinfurt green are considered to be the best insecticides. The former is more effective during hot weather, which the author attributes to the influence of the sun's rays on the beetles. He describes some of his experiments, which have shown that when exposed to the rays of the sun the beetles perish, even when they have not been proviously poisoned. The effect of barium chloride is to produce paralysis of the legs, which prevents the beetles from taking shelter from the sun underneath leaves, where they normally hide during the hot hour-In wet weather the effect of this insecticide is not so great and sometimes it is quite useless. "Djipsin" and Scheele's green are not so effective as the two first-named insecticides, which may also be combined.

GEANDI (G.). Gli stati postembrionali di un Coleottero (Otiorrhynchus cribricollis, Gyl.) a riproduzione partenogenetica ciclica irregolare. [The postembryonal stages of a beetle (O. cribricollis, Gyl.) with parthenogenetic reproduction at irregular intervals.]—Boll. Lab. Lool. gen. agrar., Portici, vii, 24th Sept. 1913, pp. 72-90, 12 figs.

of the weevils of the genus Otiorrhynchus, Germ., three species are already known to reproduce parthenogenetically at irregular intervals; 11 turen. Boh., O. ligustici, L., and O. cribricollis, Gvl. The author gives a full description of the last-named species in all stages. The eggs are laid at night in the second half of September and early in October. The females seem to prefer dewy nights, when they climb up the stems of the lucerne, on which they feed, and drop their eggs on to the ground. In the laboratory the eggs hatched out in 14 to 24 days, and the larvae almost immediately disappeared into the soil. The adults begin to die in October and none are to be found by November. The author could not ascertain if any hibernate. The larvae have considerably increased in size by the end of November, and are then at a depth of 4 to 6 inches, feeding on the tender rootlets of the lucerne. The larval stage lasts about 6 months, till the following May; the pupal stage lasts from 10 to 15 days and the image appears about the middle of June. It is then often the prey of an Ascarid, which is at present being studied. During July, August, and September the immature adults remain hidden by day a couple of inches beneath the surface, whence they issue at night to feed. Although the damage done by larvae and adults to the lucerne plantations at Portici are by no means negligible, vet it is not such as to cause alarm.

Grandt (G.). Descrizione della larva e della pupa della Sitona hameralis, Steph., ed osservazioni sulla morphologia dell'adulto della medesima specie. [Description of the larva and pupa of Sitones theorealis, Steph., and remarks on the morphology of the adult of the same species.]—Bull. Lub. Zool. gen. agrar., Portici, vii, 6th Oct. 1913, pp. 93-100, 7 figs.

The larva of Sitones humeralis, Steph., feeds on the roots of various species of lucerne: M. sativa, L., M. hupulina, L., M. minima, Gruf. In view of the slight differences existing between the larva of S. humeralis and, for instance, that of Otiorrhynchus cribricollis, Gyl., the author believes that the distinctive characteristics of the larval stage of the various species of Sitones will not be markedly different. A very fully detailed description is given of S. humeralis, the full-grown larvae of which were found at Portici early in May. About the middle of the same month nearly all had transformed into pupae. The pupal stage lasts from 10 to 14 days. In captivity the imago appeared in the first week of June.

PALMER (E. F.). Box-Packing of Apples.—Ontario Dept. Agric. Toronto, Ont., Bull. no. 216, Oct. 1913, 24 pp., 13 figs.

This bulletin gives a detailed account of the best methods of packing apples in boxes. Regarding the wiping of apples there has been some discussion. The advent of the codling moth has made spraying imperative and it is this spray that is objectionable. An apple after being

wiped presents a better appearance to the average buyer. Wiping is easily done immediately after the fruit is picked. The apple shouli not be rubbed hard, the object being simply to remove the dust and spray, of which many people are afraid because of its poisonous nature, though it has been proved that it would take the spray from apples to make a minimum dose of poison dangerous to a human being. A pair of cheap cotton gloves is superior to a rag for wiping.

REUTLINGER (—). Eine erfolgreiche Bekämpfung des Heu- und Sauerwurms. [A successful method of combating the vine-moth.]
Weinbau der, Rheinpfalz, Neustadt a. Hdt., i, no. 24, 15th Dec. 1913. pp. 308-311.

In an isolated vineyard of about 6 acres the author has succeeded in stamping out the vine-moth. The measures against the pupawere applied in 1910, 1911 and 1912. The grubs were combated in 1911, and also in 1912, though not so extensively. As a result only 11 moths were observed in 1913, and Peronospora and Oidium being also absent, perfectly healthy grapes were obtained. Nevertheless the methods employed against the pupae-brushing the stocks earthing them up, and careful burning of all debris-were carried on in 1913, and the author lays very great stress on their conscientions execution. In dealing with the grubs the following formula waused: (a) 2 gals, water, 1 lb, soft soap, 1 lb, fusel oil, 12 oz, raw nicotin (98 per cent.); or the alternative formula: (b) 2 gals, water, 1 lb. soft soap, 1 lb. methylated spirit, 1 lb. duty free tobacco-extract. The cost for these quantities was: soft soap $2\frac{1}{2}d$., fusel oil is 6l. raw nicotin (98 per cent.) 1s. 6d., methylated spirit 21d., duty free tobacco extract 1s. 1d. The solution was squirted into suspicious places with sewing-machine oilers, with the nozzles of which any webs present were removed before injecting the insecticide. The work was performed by children, who are found to be by far the best suited for it. Walls, tree-trunks, etc., were searched and treated. Taking a working day of 8 hours, the wages of a man at 3s., those of a girl at 1s.; the costs for labour during the 19th, 22nd, and 28th June 1911, worked out at 17s., 17s., and 16s. respectively. One man was employed on all 3 days, 14 girls on the first two, and 13 girls on the third; 20 gals, of emulsion (a) were used at a cost of 32s. The total expense for the 6 acres was £4 2s. (or £3 5s. if emulsion (b) is used). To this the cost of 20 oilers (5 kept as a reserve) must be added, 6s. In view of the poisonous nature of the insecticides, the workers were not allowed to take any food with them to the vineyard The author states that wages have increased since 1911, and says that although he has practised bird protection for the past 20 years, the birds appear to do more harm than good.

VIERECK (H. L.). Type Species of the Genera of Ichneumon Flies.— U.S. Nat. Mus., Washington, D.C., Bull. no. 83, 1914, 186 pp.

This bulletin consists of an alphabetic catalogue of the genera of the Ichneumonoidea together with the type of each genus, and references to descriptions of the genera. An index to the genotypes has been added. Britton (W. E.). Thirteenth Report of the State Entomologist.— Report of the Connecticut Expt. Stn. for 1913, New Haven, 1914, pp. 181, 3 pls.

During the year 1913 there was an unusual abundance of the appletree tent-caterpillar, Malacosoma (Clisiocampa) americana, F., its presence being reported from very many towns. Specimens of the forest tent-caterpillar, M. disstria were received from Wallingford and Salisbury. The result of this abundance of tent-caterpillars led to the preparation of a new publication which appeared in August as Bulletin 177 [see this Review, ser. A, i, pp. 381-382], and gave a full account of the insects. Many cocoons were collected and nearly one-half of them were found to be parasitised by Ichneumons and Tachinid flies. A large proportion of the Ichneumons belonged to the genus Pimpla, P. conquisitor, Say, being one of the commonest species.

During 1912 white grubs were extremely abundant in Connecticut and similar damage was feared for 1913. Few complaints of white grub injury were, however, received; neither were the adult beetles so abundant as expected. The species were identified as Lachnosterna.

fraterna, Harr., and L. fusca, Froehl.

Serious damage to yews, Taxus cuspidata var. brevifolia, was reported from a nursery at Pomfret. From material forwarded to the laboratory the species was recognised as Otiorrhynchus sulcatus, F. This wevil devoured the small roots of the plants and attacked both the larger ones and the main stem below the surface of the ground. A similar injury to the roots of young hemlocks was recorded as caused by O. oratus, L. Both O. oratus and sulcatus are European species and the latter is recorded as injuring Taxus and Rhododendron plants in Europe. O. sulcatus has also been recorded as injuring grape vines, cyclamens and ferns, and as occasionally attacking garden vegetables. It is suggested that possibly carbon bisulphide injected into the ground around the plants in late summer might kill the larvae before they had seriously injured the plants. It has also been reported that in south-western Connecticut and in adjoining portions of New York State during the past two or three years many hickory trees have died and many more have been injured. The chief cause of this seems to be a small beetle, Scolytus quadrispinosus, Say. During July and August the beetles tunnel in the new growth at the axils of the compound leaves, causing them to break off. Later the parent beetles make their brood galleries just under the bark. When there are many galleries in the main trunk of a tree the effect is the same as girdling and the tree soon dies. Badly infested trees cannot recover and should be removed. Dr. Hopkins recommends that all infested trees be disposed of between 1st October and 1st May, so as to kill the over-wintering beetles. This can be done by peeling or by using the wood as fuel. If the outer portion be allowed to remain on the logs during the following summer the beetles will escape and may attack other trees. If a tree is not infested it may be worth while to spray the bark on the trunk and branches with lead arsenate, 1 lb. in 5 gals, of water. Thoroughly spraying the foliage with the same mixture after about 1st July may prevent damage to the leaf stems.

Infested fruit from Cannon Station, Mystic and Watertown contained the larvae of the pear midge, Contarina (Diplosis) pirivora,

Riley. This insect is distributed throughout the north-eastern United States and in Central Europe. The adult is a small twowinged fly which lays its eggs in the clusters at blossoming time or even earlier. Dr. Felt has found the larvae at the base of the calvx at the time the petals fall and they soon work their way into the young fruit. The infested pears usually crack open after rain and thus allow the maggots to escape. These maggots go into the ground to pupate and the adults emerge the following spring. Certain varieties as Bosc, Bartlett and Seckel seem to be injured more than others, The species has been gradually eradicated in New Jersey, but maintains itself in a few places near Newark and New Brunswick. No. remedial treatment is known other than gathering and destroying the infested pears before the maggots leave them. The injured fruit may be distinguished by their deformed appearance. Cultivating the soil during the month of June would doubtless destroy many larvae in the ground.

In Greenwich, Conn., the West Indian Peach Scale, Aulacasuis pentagona, Targ., was discovered on Chinese privet, Ligustrumibota. It had not previously been recorded from Connecticut. It infests a great variety of plants belonging to widely different botanical families. and has a wide distribution. Dr. H. T. Fernald states that it has been found abundantly on flowering cherry imported into Massachusetts. and it is believed that this insect was present on weeping cherry imported from Japan three years ago into a Connecticut nursery, These trees were fumigated with hydrocyanic acid gas and when examined were clean. The low temperatures experienced during the winter in the States will probably prevent this scale from becoming a destructive pest. When not covered by the bark of the host plant the scales are white and conspicuous like therose scale, A. rosae, Bouché. If the scale withstands the winters and infests and injures trees and shrubs it is probable that a thorough spraying with a good contact insecticide, like the lime-sulphur wash or one of the oil mixtures, will serve to hold it in check.

Britton (W. E.). Insect Notes.—Rept. Connecticut Agric, Expt. Sta. for 1913, New Haven, 1914, pp. 250-256. 2 pls.

As a result of an examination of unhealthy and dying oak trees at Greenwich the trouble was found to be due probably, not primarily to insects, but to injury from cold and drought, followed by attacks of borers. The spruce bud moth (Tortrix fumiferana, Clem.) was very abundant in 1913 and swarms appeared suddenly on 31st July. The parsley stalk weevil (Listronotus latiusculus), not previously reported from Connecticut, was found at a farm in New Haven, and Pulvinaria vitis, L., which has seldom been injurious in Connecticut, has badly infested some silver maples at Sound Beach, Stamford. Omphalocera dentosa, Grote, has apparently been more abundant and done more damage in 1913 than in any preceding year since observations began. It is noted that the egg-clusters of the tussock moth (Hemerocamps definita. Pack.) are often mistaken for those of the gipsy moth, but the whole cluster is more loosely constructed and the eggs more exposed in the former. As a rule also the eggs of Hemerocampa are deposited on a network of silk, on or near the old cocoon. Gipsy moth eggs are usually laid on a solid surface, except in the case of great abundance.

The San José scale, which for fifteen years has been a serious enemy of fruit trees, seems to be now on the wane, probably owing to the work of parasites and to spraying. The poplar sawfly, Trichicampus everalis, Fallén, has been common on Carolina poplars. There are two broods of larvae each year, the first appearing in June. These are two broods of larvae each year, the first appearing in June. These with lead arsenate. The larvae of the Longicorn beetle, Saperda costa, were rather common in young linden trees in one nursery this year. They tunnel under the bark and in the wood at the base. Where this borer causes damage, the only remedy is to examine the trees in May and September and to dig out the larvae or kill them in the burrows with a wire, or by injecting a few drops of carbon bisulphide and closing the opening.

Lypus pratensis, L., was unusually abundant in 1913, and injured many plants by sucking the sap from the bud or leaf stem. Several complaints were received regarding injury to dahlia buds, and in

Litchfield, potatoes were damaged by this bug.

BRITTON (W. E.) & WALDEN (B. H.). Inspection of Imported Nursery Stock and of Apiaries.—Rept. Connecticut Agric. Expt. Stn. for 1913. New Haven, 1914, pp. 191-198.

A Federal quarantine and inspection law came into operation on 1st October 1912, which provided for a system of notices and permits covering all imported field-grown, woody stock entering the United States from other countries, and its enforcement is vested in a board designated as the Federal Horticulture Board. When the Federal law became operative the inspectors received notices as for all other stock and the consignee was requested to send notice to the inspector manediately on arrival of each shipment. Return post-cards were immished. In some cases the consignee complied with the request, but in many instances the stock was unpacked and distributed without sending such notice, or the notice was sent and the inspector found that the stock had been unpacked and mixed with other stock. It became necessary therefore to obtain thorough and proper measures for inspection. The matter was placed before the legislature and Section 4388 of the General Statutes was amended as follows:

All nursery stock shipped into this State shall bear on each package a certificate that the contents of said package have been inspected by a State or Government Officer and that said contents appear free from all dangerous insects and diseases. If nursery stock is brought into this State without such a certificate, the express, freight, or other transportation company or person shall, before delivering shipment to consignee, notify the State Entomologist of the facts, giving name and address of consignee, origin of shipment, and approximate number of cars, boxes, or packages, and probable date of delivery to the consintest. The State Entomologist may cause the inspection and, if infested, the treatment of the stock. No person, firm, or corporation shall unpack any woody, field-grown nursery or florists' stock brought into this State from foreign countries, except in the presence of an inspector, unless given permission to do so by the said State Entomologist or one of his deputies. If such stock is found infested with

any dangerous pests the State Entomologist may at his discretion order it to be treated. Any person violating any of the provisions of this act shall be fined not more than fifty dollars. (Amendment approved 5th June 1913.)

During the year just closed 1,316 boxes and packages of imported nursery stock have been inspected. This stock was contained in 246 separate shipments, and in seven of these insect and plant diseases were found. The insects reported are: "Lachnus: An Aphid, sp., o. confers from France: a specimen of the Chrysomelia beetle Agelas'oo, (Galeraca) alni, L., on a box of ornamental stock and on English by (Hedera helix); the oyster-shell scale (Lepidosaphes ulmi, L.) and an aphis on maple, the last two shipments coming from Holland; an egg of the Chinese mantid, Tenodera sinensis, Sauss., on umbrella pinform Japan; two specimens of mealy bug on conifers from Belgum, specimens of a soft scale, Coccus hesperidum, L., and of the fig scalon bay trees (Laurus nobilis), also from Belgium; a single Noctua pupa on a plant of Box (Buxus) from Holland, the adult emerganging identified as Mamestra dissimilis, K.; an: Aleurodes on a number of shipments of Azaleas from Belgium.

As a result of the autumn meeting of the Connecticut Beekeepers Association in 1912, where it was voted to ask for a larger appropria tion for inspecting apiaries and to amend the law to make the work more effective, a bill was introduced into the General Assembly, and an Act finally passed, as an "Act concerning the suppression of Contagious Diseases among Bees Chapter 141 of Public Acts of 1913." This Act repealed Chapter 185 of the Public Acts of 1909 and makes it the duty of the State Entomologist to examine apiaries, to quarantine such as are diseased, and to treat or destroy cases of the disease known as foul-brood. The Act also requires that all shipments and transportations from without the State shall be examined, and in case contagious diseases are found such shipments shall be returned to the consignor or delivered to a duly authorised inspector for treatment or destruction. The statistics of apiary inspection in 1913 and a summary of the inspections for the past four years are shown in tables. With the increased appropriation and authority to inspect without complaint granted by the above Act, which became operative on lst October 1913, a much larger number of apiaries will be examined next season.

Britton (W. E.) & Caffrey (D. J.). The Control of the Gipsy and Brown-Tail Moths in Connecticut in 1913.—Rept. Connecticut Agric. Expt. Stn. for 1913, New Haven, 1914, pp. 198-223, 2 pls.

The gipsy moth has been all but exterminated in the only two areas known to be infested in Connecticut, Wallingford and Stonington. As a result of scouting for egg-masses at Wallingford, Stonington and other parts of the State, including the vicinity of New Londor and the town of Thompson, only two egg-masses were discovered at Wallingford, one on the foundation of a house and the other on a fence near this house. Precautions were also taken against the caterpillars and searches made for them, but during the summet of 1913 only three were taken at Wallingford. Scouting was also continued in Stonington, and as a result five caterpillars, one cocoon and

one female moth, which was depositing eggs, were found where no caterpillars had been found since 1910 and no egg-masses since 1911, though the trees have been banded each year. The presence of the caterpillars is not yet understood, unless it be a reinfestation. Tables are given showing the reduction of this pest at Wallingford and Stonagton, according to which there were destroyed at Wallingford in 1910, 8.234 egg-masses, 8.936 caterpillars and 96 cocoons, numbers which in 1913 were reduced to 2 egg-masses, 3 caterpillars and no cocoons. At Stonington reduction of the pest is also recorded. In 1906, 73 egg-masses, 10,000 caterpillars and 47 cocoons were destroyed; in 1911, only 3 egg-masses were found; and in 1912, nothing at all; anywered.

The result of control measures against the brown-tail moth in Connecticut during the past winter indicates that the area known to be infested has been greatly increased since last year and now includes over 27 towns. In this paper the towns are given with the details and positive of scouting. The number of nests have slightly increased in some of the towns and others are infested only to a slight degree. In addition, large infestations were found at Hartford and Suffield. In this work open country was carefully examined and particular attention given to the fruit trees in orchards, around dwelling-houses and along the highways. The brown-tail moth also attacks oak trees in the woodlands, but on account of the leaves hanging on these trees t salmost impossible to detect the nests, and moreover many of them are very far from the ground and it would be very expensive to reach them. For these reasons it is impracticable to scout the entire State and destroy the nests. A table shows the number of nests found and destroyed in each town in 1913 and during the last three years in Washam County. In most there is a marked increase in number from 1912 to 1913.

On account of the presence of the brown-tail moth in Connecticut and the danger of spreading this insect by shipping nursery stock, a quarantine was established by the Federal Horticultural Board, becoming effective on and after 25th November 1912. Later on the quarantine was extended to take effect on 1st August 1913 to include all the present infested area. Nursery stock within this area could not be shipped outside of it unless inspected at the time of packing and duly certified by a Federal inspector. The infested towns, as well as the quarantined area, are shown by a map. The Federal authorities, in co-operation with the State of Massachusetts, have imported into the country all the parasites known to attack both the appsy and brown-tail moths in the various European and Asiatic countries where these moths occur. The control of this pest by its natural enemies is one of the most promising methods. One of the most effective of the introduced parasites is an Ichneumonid, Apanteles lacteicolor, Vier., which attacks the hibernating caterpillars. A Tachmid, Compsilura concinnata, Mg., parasitises both the gipsy and brown-tail caterpillars and seems to be well established and spreading freely in Massachusetts. freely in Massachusetts. The planting of these along the boundary of the infestation will doubtless reduce the numbers of brown-tail moths and thus check their spread southward and westward. Apanteles also attacks caterpillars of the genera Datana

and Hyphantria (fall web-worm), and Compsilura has been reated from the tussock moth, the fall web-worm and the imported cabbage worm.

WALDEN (B. H.). A Lepidopterous Leaf-Folder on Privet.—R_F Connecticut Agric. Expt. Sta. for 1913, New Haven, 1914, pp. 223-226, 2 pls.

Many privet hedges in New Haven were attacked during May 1913 by larvae which fied together the terminal leaves, forming an enclosus within which they fed. The adult was a Tortricid moth and determined by Mr. W. D. Kearfott as Archips rasana, L. This species was introduced from Europe, where it has been observed feeding on apple elm, willow, birch, wild rose, raspberry, hazel, linden, aspen, hawthor, current and gooseberry. The eggs are laid on the twigs in small flattened, oval masses, covered with a dull waxy substance, the masses laid in the breeding cages containing from 24 to 81 eggs. The eggs hatch from about the 1st to the middle of May. The larva feeds on the tip of the growth where it draws two or more leaves together well silk, thus forming an enclosure within which a single larva feeds as } later pupates. The first pupae were found in the breeding cages of 3rd June and the first adults on 10th June. There is one brood each year and the winter is passed in the egg stage. Many larvae hat eggs of Tachinid flies deposited on the head and first segment of the body, and the flies began to emerge from larvae collected on 18th June. The species was determined as Exorista pyste, Walk. Trimming the hedges will remove most of the infested tips which should be gathered and destroyed to kill the larvae. Some of the larvae will let themselves down to the ground when disturbed and later return to the plants The hedges should be examined after a few days and any infested tip-Should this insect become troublesome on should be removed. currants and gooseberries, it may be controlled by a thorough sprayie: with lead arsenate at the rate of 2 lb, in 50 gals, of water, soon after the leaves unfold.

Britton (W. E.), & Walden (B. H.). Field Tests in Controlling Certain Insects attacking Vegetable Crops.—Rept. Connection Agric. Expt. Sta. 1913, New Haven, 1914, pp. 232-237, 2 pls.

An account of an experiment to test a control for the cabbage fly. Pegomyia brassicae. Bouché, is given. Varieties of plants were arranged in order and an area selected for special treatment, namely for the application of tar paper disks. The disks were cut in the form of hexagons, four inches in diameter, from single ply tar paper, and verplaced on the stems of plants at the time of setting. Some plants were then "damping off" and failed to recover: others were killed by the cabbage maggot. Of the plants which remained 12 per cent. It is the untreated ones and 0.05 per cent. of the disked ones were maggoty.

As a control for the cabbage aphis, Aphis brassicae, L., "Black Leat 40" at the rate of one teaspoonful to a gallon of water, with soap added as a spreader, proved effective and all the aphids were killed. In the tests for a control for the onion thrips, "Black Leaf 40," 1 part to 768 parts of water, and soft-soap; "Black Leaf 40," 1 part to 99 parts of water, and soft-soap; "Scalecide," 1 part to 50 parts of

water, and lime-sulphur, 1½ parts to 50 parts of water, with paste spreader, were tried. None of these was successful. The Scalecide did not coat the onions so well as the "Black Leaf 40" and injured the Lants: nor did the lime-sulphur coat the onions satisfactorily.

As a result of testing for a control for the pea aphis, Macrosiphoen Kalt., it was found that spray mixtures do not stick readily to he smooth leaf-surface of peas, but gather in drops and roll off. A small amount of common soap dissolved and added to the mixture will usually cause it to spread readily and stick to the foliage. Flour taste did not prove so good a spreader as the soap. Treatments were hade in a pea-field and the field was examined after two days. By reatment with "Black Leaf 40" (two teaspoonfuls in one gallon of water, with paste spreader) all aphids hit by the spray were killed, but many live aphids were found on portions of the plants not coated with the spray. The material did not spread so well as where the soap was used. "Black Leaf 40," two teaspoonfuls in one gallon of water, with soap at the rate of 4 pounds to 100 gallons, spread well and very be her aphids could be found. "Black Leaf 40," one teaspoonful o, one gallon of water, was just as efficient as where twice the amount of Black Leaf 40" was used. These sprays did not injure the foliage. solecide, one part to fifty parts of water, caused considerable injury to the foliage. There were two varieties of peas in the field. Thomas Lexton and Sutton's Excelsior. No aphids were observed on the former, while the latter was generally infested. If the aphids had been observed at the time they first appeared, when the vines were smaller, the spray could have been applied more thoroughly with much less material. The injury to the vines in driving through the field would also have been much less. The tests with "Black Leaf 40" were quite satisfactory.

Report for the Year ending July 1913 on the Trade of Smyrna. Deplomatic and Consular Repts., Turkey; Annual Series, no. 5247, London, Jan. 1914.

Reporting upon agriculture in Adalia for the year ending July 1913, Mr. Vice-Consul G. A. Kenn mentions the fact that Icerya purchasi, Mask, which has greatly damaged groves of mandarin oranges and emon trees, was considerably checked during the year, not as in the previous year by cold weather, but through the agency of a solvhird. Novius cardinalis, which feeds exclusively on Icerya. Varies was introduced into Adalia from Scio, where I. purchasi was also destroying the groves. The Icerya pest is now quickly disappearage, being gradually but surely eradicated by Novius, which spreads with great rapidity.

MARLATT (C. L.), The Alligator Pear Weevil.—Entom. News, Philadelphia, xxv, no. 1 Jan. 1914, p.37.

On page 416, Entomological News, xxv, No. 9 [see this Review, ii, Ser. A. p. 13]. Hawaii and Porto Rico are incorrectly cited as localities a which the avocado weevil (Heilipus lauri, Boh.) is known to occur. The only records of this weevil that are known to the author outside Mexico are Central American. Naturally, no quarantine action will

be taken, or is intended, against the islands referred to, or other avocado-producing countries free from this weevil.

FERNALD (H. T.). Parasites of the San José Scale.—Entom. News. Philadelphia, xxv, no. 1, Jan. 1914, p. 39.

The author states that the parasite reported as doing such effective work against the San José scale in Pennsylvania was discovered at Amherst, Mass., in the autumn of 1912 in great abundance. Specimens were sent to Dr. L. O. Howard, who declared it to be a new species of Prospatiella. During the present autumn, colonies of this insect have been sent to Washington and Georgia in the hope of establishing it there. A shipment of the Pennsylvania parasite has made direct comparison possible and there can be no doubt that they are the same species. This insect was described under the name of P. pernicion by Mr. D. G. Tower and the description published in March 1913.

BLODGETT (F. M.). Experiments in the Dusting and Spraying of Apples.—Cornell Univ. Agric. Expt. Sta., Ithaca, New York, But. no. 340, Jan. 1914, pp. 149-179, 1 fig., 1 pl.

In this Bulletin are given detailed accounts of experiments on the dusting and spraying of apples, to determine the effectiveness of a dust mixture containing 20 per cent, of dry powdered arsenate of lead and 80 per cent, of finely divided sulphur, and of a paste containing the same materials with a small quantity of a colloidal substance to keep the lead and sulphur in suspension, to be applied with water as a carrier, as compared with the standard lime-sulphur solution with arsenate of lead and with an unsprayed check. The insects causing most injury to the apples in 1913 were those classed under "Bud moth and other spring caterpillars"; these include leaf-rollers, green fru: worms, etc. From the tables given it is seen that the best control of each of these insects was secured on the dusted plants, with the possible exception of those in which codling moth larvae entered the calyx: there was practically no difference in the insect control between arsenate of lead applied with lime-sulphur and that applied with suspended sulphur, the latter, perhaps, proving more effective for bud moth and other spring caterpillars and for codling moth and Curculio.

KANEHIRA (--). On some Timbers which resist the Attack of Termites -- Indian Forester, Allahabad, xl, no. 1, Jan. 1914, pp. 23-42.

The author, writing from Formosa, states that termites, or whiteants, are amongst the most destructive insects in that island, attacking field crops, buildings and trees. Few dwellings are free from these insects, since in Formosa the houses are mostly made of wood, owing to the expense of other building material. Among the termite attacking buildings are Coptotermes formosanus, Shiraki, Leucotermes flaviceps and Termes formosanus, the method of attack being different in each species. Experiments were made on the power of resistance of Formosan trees against the attack of termites. Pieces of 59 dried timbers and 41 undried timbers were used, each piece, 1' 5" long and 1½" square, being buried perpendicularly with three inches above

ground exposed. Details of the experiments, dates of inspections, etc., are given in tables. As a result of this work, the characters which make timber termite-proof are stated to be:—(a) the presence in the wood of some substance which has a strong smell or taste which the insects do not like; (b) the presence of some substance which is polynomial to the insects; and (c) the extreme hardness of the wood, but dering it too hard to attack; examples of each character being growth.

In a note by the Forest Zoologist. Dehra Dun, on Mr. Kanchira's contribution, attention is called to the fact that the durable timbers, while possessing a relative immunity from white ant attack, are, in her certain conditions, readily eaten by the destructive species, no absolutely immune species of untreated timber having been discovered by experiment, so far as is known. Definite indications of absolute community can only be obtained by actual infection with the termites, smeat does not necessarily follow that the buried wood will be attacked.

RUTHERFORD (A.). Insects on Rubber in 1913. - Trop. Agric., Peradeniya, xlii, no. 1, Jan. 1914, pp. 41-44.

Herea brasiliensis (Para Rubber). In August a Cerambycid beetle Marchotypa verrucicollis, Gahan) was sent in from the Kandy District, where it was attacking rubber stumps, chiefly withered ones. Experiments lead the author to conclude that while this beetle is able to eat the bark with impunity in spite of the flow of latex, it prefers dry takes. There are records of it on Heyea from Matale and Ukuwela, the last report dating from 1907. The trees attacked should be sprayed with lead arsenate. Saissetia nigra, Nietner, the black scale, ocurs widely on Hevea in Ceylon. It feeds on the leaves and twigs and is frequently attended by the large red ant, Oecophylla smaragdina, which often draws the leaves together to form a shelter over the scales. S. nigra is a serious pest of cotton in the West Indies, and in Cevlon ocurs in injurious numbers on cotton and Croton tiglium. That sale-insects are able to subsist on trees containing latex is proved by the fact that Coccus viridis, Green, occurs on the leaves of Funtumia Pistica. Plumeria sp., Landolphia kirkii and Alstonia scholaris; as and as by the fact that S. nigra itself flourishes on Herea brasiliensis and Manihot glaziovii. S. nigra in Ceylon is not so subject to the a tacks of hymenopterous parasites as are some allied scale-insects, though the author has reared several specimens of what is very probably " "llista cyanea from the scales on Croton tiglium, and has observed that the eggs are subject to the depredations of a Cecidomyid larva. The author thinks no chances should be taken with S, nigra and destruction should be effected whenever an opportunity presents itself. The att is often a nuisance on tea and fruit trees in many parts of Ceylon, and the nests should be broken up and sprayed with kerosene emulsion. Phorid flies were found to have laid their eggs on decomposing smokecircl tubber, and the maggots were feeding on the products of decomrestion. Probably the rubber had been insufficiently dried, as it had developed a mould. The adult flies are small and active and generally lay their eggs in decomposing organic matter.

Fantamia elastica. The caterpillars of the Pyralid moth, Caprinia concludatis, Guen., were found feeding on the leaves of F. elastica near

Peradeniya on the 10th October. By the 6th November the trees werheavily infested and had a withered appearance due to the dead leaves A month later only a few withered leaves remained on the tree, and neighbouring trees of Funtumia, that had up till then remained almost free from attack, were beginning to show here and there a withered leaf. This afforded an object lesson of the consequence of neglectics the first stages of an attack. Had a thorough spraying with lead arsenate, at a strength of 5 lb. to 100 gals, water, been undertaken the outbreak would probably have been arrested. Hampson gives the distribution as Sikkim, Assam, Bombay, Nilgiris, Ceylon and Burma. Green records the larva as feeding on Portlandia grandiffor: and Holarrhena mitis. Neighbouring trees of Funtumia were infested with Coccus viridis, and the leaves were covered with sooty mould An undetermined Pyralid larva was feeding on the scales, and they were also attacked by a greyish black fungus. Pulvinaria sp. was also present on the leaves, and also not a few specimens of Lecanous candatum, Gr.

Manihot glaziovii (Ceara Rubber). Beetles were found boring in several trees that had had their bark skinned during the wet weather in preparation for tapping. One is probably a species of Xyleboro, while the other is a long-snouted, slender, dark-brown weevil about 45 millimetres long. Saissetia nigra has been observed on the leaves of M. glaziovii.

Landolphia kirkii (African Rubber). A plant of this species in the Botanic Gardens was found infested with Coccus viridis, Gr., the leaves being black with sooty mould, and also heavily infested on their under surface with Ichnaspis longirostris, Sign.

BARRETT (O. W.). Cacao Culture.—Philippine Agric. Review, Manile, vii, no 1, Jan. 1914, pp. 5-15, 4 figs.

At the end of this paper on cacao culture, the author notes that a severe pest of this plant in probably all provinces of the Philippines is the branch-boring beetle [species not stated.] The grub of this insect bores up or down through the centre of the branch causing very severe weakening and final death of the affected portion. Branch-suspected of containing these grubs, i.e., those having one or metholes in the bark and showing a weakened condition of the foliage, should be removed and burned. On young plants, scale-insects, aphis, and leaf-eating beetles sometimes do a slight amount of damagnut can be easily controlled.

MUNRO (J. W.). The Variegated Willow Weevil (Cryptorhypeksslapathi, L.).—Gardeners' Chronicle, London, lv, no. 1411, 10th Jan. 1914, p. 27, 2 figs.

This weevil has recently been reported from the North of Scotland, where it appears to be more widely distributed than has hitherebeen supposed. It is chiefly an enemy of the willow, although it about attacks alder, birch and poplar. Both adult and larva are injurious the adult gnaws the tender bark of the young shoots, causing them to wilt and die off; the larva eats into the bark of the stem and main branches, almost girdling them, and then bores into the wood itself.

semetimes penetrating into the pith. It pupates in the wood, and may hibernate there.

The damage to the tree may be very considerable; the early work of the larva is the most serious, in that the sap-flow is always reduced. and may even be stopped; stems and branches from 1 6 inches in Hameter may be destroyed in this way. The only remedy is to semove all infested stems and branches during the winter months, ost burn them. In this way the weevils are destroyed before emerging.

Perget purchasi and Novius cardinalis in Malta.-Colonial Reports, No. 786, Malta, 1912-13, London, Jan. 1914, p. 12.

In the agricultural section of the report it is stated that during the spring of 1913 there was an outbreak in Malta of the fluted scalemost, Icerya purchasi, in certain localities, but that, owing to the drastic measures taken and the timely distribution of the ladybird, Norms cardinalis, the spread of the pest was checked.

Bugnath (R. S.). Brief Descriptions of new Thysanoptera, II. Ann. Mag. Nat. Hist., London, xiii, no. 73, Jan. 1914, pp. 22-31.

Of ten new species of Thrips described, two are of economic interest, Laying been found attacking cultivated plants. These are Scirtothrips · pipennis, found on the under leaf sheaths of banana in Peradeniya, Cerlon; and Gynaikothrips karnyi from the same locality, from marginal leaf-galls of black pepper (Piper nigrum).

EUSCK (A.). The Chestnut Bast-Miner .- Insecutor Inscitiae Menstruus, Washington, ii, no. 1, Jan. 1914, pp. 3-4, 1 fig.

A description is given of a new species of Tineidae, referred to by Mr. A. G. Ruggles as having an important bearing upon the spread of the chestnut bark disease [see this Review Ser. A, ii, pp. 29]. The new stories which has been called Ectoedemia phleophaga, Busck, is closely affed to the other species of this genus which feeds on chestnut, the gall-making E. castaneae, Busck. The larva was found in be lower layer of the bark of a chestnut, encroaching upon the cambium. The mine is slender and serpentine, a few millimetres broad and several centimetres long; in April and May the fully grown larva leaves the mine and falls to the ground, where makes a cocoon, often boring down a few inches into the loose surface From the specimens reared, imagos emerged during September. The specimen described was taken at Falls Church, Virginia.

LABOY (O.). A Borracha no Brazil. [Rubber in Brazil.]-Minist. da Agric. Indust. e Comm., Rio de Janeiro, 1913, 153 pp. 99 figs.

The author says that in the rubber districts of the Amazon a species termite. Coptotermes marabitanos, Silv., locally known as "broca," weeks by preference the tapping cuts on the trunks of Heren and is somewhat difficult to combat. Manicoba rubber (high mear Bahia is attacked by the larva of an insect of chach the generic name is not given. The author says that at Machado Portella it is attacked by the same form as that found in the district of Jequié, where, however, it is in most years not $v_{\rm err}$ abundant. This is a lepidopterous larva related to the Sphingida. These larvae eat the leaves, especially in March and April, and al-completely destroy manioc plants (Manihot utilissima). Zehatar found at Villa Nova a thrips which in various stages was attached to the lower surface of the Manicoba leaves; as a result of the attack the leaves dry up and fall off prematurely. All green parts of the tree may be attacked and young trees up to two years old suffer there A spray of 1 per cent, solution of nicotin or petroleum emulsions. useful against them, and it is sufficient to spray the young trees only Ants are the most formidable pests of Manihot. Locusts, amongst the a species of the genus Tropidacris, also eat the leaves. Lesne has reported damage to M. glaziovii in the district of Baturité by Curculionid, Coclosternus rugicollis, Boh., which in the larval stage bores short galleries into the end of the dead shoots or dead wond ... the trunk. A Scolytid, Xyleborus confusus, utilises the galleries of Coclosternus and prolongs them, invading the whole tree. The loss remedy appears to be to examine the trees and cut off all dead branches and see that the wound cicatrises properly.

Pointer (L.). Réunion viticole à Lyon. [Meeting of vine-growers and Lyons.] - Rev. Viticulture, Paris, xli, 1st Jan. 1914, pp. 17-23.

M. Deville, Director of Agriculture in the Department of the Rhin-recommends lead arsenate against the vine moths, Clysia ambigodiand Polychrosis botrana, and the flea-beetle, Haltica ampelophaga, Guri Nicotin may be used against the second generation of Clysia and Polychrosis. M. Jouvet, Director of the Côte-d'Or, stated that Halai was reported at Vosne and at Volnay in the spring of 1913, but we controlled by non-acid sprays mixed with arsenates, which are aleffective against mildew. M. Gillin, Director of the Puy-de-Dôn said that Rhynchites betulae, L., had been abundant and the collected of its cocoons was effected in spite of the expense. Clysia had been methodically combated with nicotin, arsenic, or copper-nicotic Bait-traps had been employed against Polychrosis. Efficient Letterotection is asked for.

LARUE (P.). Tableau indicateur des traitements insecticides. [A indicator for the use of insecticides.]—Rev. Vitic., Paris. A. 1st Jan. 1914, pp. 23-24, 1 fig.

The author points out that when engrossed in combating million the vine-grower often forgets to apply insecticides at the proper the and a table like the one dealing with Clysia ambiguella (Cochylspropared by M. L. Fulmek and published by the Vienna Station Plant Pathology, would be very useful. This table measures in inches by 70 inches and on it a disk of 28 inches diameter is printed in colours with instructions in bold type beneath it. The disk divided into 12 monthly sectors in which the various stages of the 1-7 are depicted, so that a glance at the illustration, followed by reference to the instructions below, gives the required information.

en agriculture. [The danger of arsenic and lead poisoning in agriculture.]—Rev. Vitic., Paris, xli, 8th and 15th Jan. 1914, pp. 29-34, 64-68.

Dr. Cazeneuve, a French senator and proprietor of vineyards in Bergledais, adduces a large number of instances of poisoning due to lead arsenate used as an insecticide. Besides mentioning these most divious cases, he refers to the warning given by Lewin, the well-known taxoologist of Berlin University, to the effect that harm may be existed without any immediate apparent symptom, and the serious functional derangement which results may be beyond remedy. On the authority of Lewin, the author states that the use of arsenicals, specially lead arsenate, is forbidden in Germany. As a practical very grower, he himself considers that lead arsenate is inclinacious stainst Clysia and Polychrosis. The 1913 season in Beaujolais was exceedingly bad for those growers who had continued the use of lead resenate after the ill-success demonstrated in past years with this practicide.

Notice concernant les conditions de vente de la Régie française. [Note on the sale of Nicotin by the French Régie.] Rev. Vitic., Paris, xli, 15th Jan. 1914, pp. 76-79.

The French Régie sells three varieties of nicotin: (1) Ordinary standard tobacco-juice, containing exactly either I or 2 per cent. of meetin; (2) strong standard tobacco-juice, containing exactly 4 per cent. of nicotin; (3) standard nicotin extract, containing 10 per cent. of nicotin. To ordinary consumers the prices are calculated per kilo. (2·2·1b.) of nicotin actually contained in the liquid, as follows: (4) 25 francs; (3) 32 francs in tins of 5 litres each; 34 francs in tins of 1 litre; 40 francs in tins of 1 litre.

FENTAUD (J.). Les insectes xylophages de la vine. [Xylophagous insects of the vine.]—Rev. Vitic., Paris, xli, 1st, 8th, 22nd Jan. 1914, pp. 5-7, 41-45, 94-99, 12 figs., 1 pl.

The xylophagous or wood-boring insects of the vine are less familiar to the grower than those pests which attack the leaves and the grapes. They are rarely the cause of the death of the stock or of injury which bads to the discovery of their galleries, as they are nearly always secondary parasites which establish themselves on stocks already weakened by age, by cryptogramic diseases, or by phytophagous or rizophagous insects. In France the chief wood-borers are: Cossus, Apric, Callidium, Clytus, BUPRESTIDAE, TENTHREDINIDAE, and betmites. The last-named will be dealt with in another paper.

Cossus cossus, L., is one of the most dangerous tree-pests. It principally affects the willow, but many fruit-trees, such as the apple, plum, cheery, and fig are attacked, as are also forest and shade-trees such as the elm, poplar, oak, chestnut, maple, ash, plane, etc. The damage is sometimes enormous. Until late years Cossus was held to be early a tree-pest, but its larva has been observed attacking vines in Algeria, the Bouches-du-Rhône, the Narbonnais, and the Haute-tatonne. The author has observed this species in some weak stocks in

the Gironde. Strong stocks are generally left untouched, but any wear ones within a short distance of infested willows, elms, etc., are suscentible to attack. Preventive measures then must aim at the remode of trees of this description and, if infested, their speedy destruction, is at least that of larva in them. A hooked wire will often bring away some of the larvae from their galleries, in which a plug of cotton-well saturated with benzene or carbon bisulphide is then placed and the aperture sealed in order that the remaining larvae may be asphyxiated The Apate bore into the dry shoots, and sometimes also into the living shoots of vines weakened by parasites of the roots (Phylloxera, etc.) The species found in France are numerous; Apate sexdental muricata, sinuata, bimaculata, capucina, and monacha being the principal ones. The insects appear in spring and enter the shoots at the base of a bud, boring galleries to the level of the corresponding knot. Mating and oviposition take place there. Four or five week afterwards the larvae hatch out and bore longitudinal galleries. The are sometimes so numerous as to destroy the wood between two kinds. in a few weeks. According to Valéry Mayet, A. sexdentata has two generations a year, oviposition occurring in May and September The spring images oviposit on dead shoots, while the autumn brond may attack living ones. This species is found in Southern Europe North Africa, and Asia Minor; it has been observed not only on the vine, but on fig, mulberry, chestnut, acacia, etc. A. muricula . similar to, but bigger than, A. sexdentata and causes the same damage. It is found especially in Italy, fairly often in Provence, more range in Languedoc. The vine, olive, oak, etc., are attacked. April (Xylopertha) sinuata is also found in the South of France and has been observed near Lyons and as far as the Landes. It attacks the oar chestnut, and vine. A. bimaculata is also a southern species. It lives in dead Tamarix wood and also in the vine throughout the endolive-growing region, in Provence, Italy, Greece, Asia Minor at Algeria. A. capucina attacks very hard woods and can even bestones and leaden plates. It is found chiefly in the trunks of oak chestnut, plum and mulberry, and on the vine also in the South of France. A. monacha is found in warm regions: Southern Europ-Palestine, Abyssinia, North Africa, Senegal and Congo. In Algebra A. monacha attacks the shoots of vines weakened by various causes especially excessive salting of the soil.

The larvae of various beetles of the family Cleridae, such as Demialbofusciatus, Tillus unifasciatus and Opilo mollis prey upon the specific Apate in all their stages; while the larvae and eggs are destroy-by various entomophagous Hymenoptera, especially Proctotry (Loclius perrisi, L. tibialis, Cephalonomia formiciformis) and Charling the Charles of the Control of

If injury is being done by Apate, the first step is to clear the vineyari of all cut shoots. If living ones are attacked they must be cut of and burnt, and watering, manuring, etc., must be carried out until the vines have become strong and vigorous, healthy vines here immune. Clytus varius is a Longicorn beetle, the larva of which only attacks dead wood. Callidium unifasciatum, another Longicorn attacks dead shoots or living branches of vines weakened by Phylloart or any other cause; but it does so only rarely. Agrilus dense fascialus, the Buprestid of the vine, is found everywhere in Europe

in North Africa. Its larva lives in the bark and liber of the stocks and does little damage. Of the sawflies (TENTHREDINIDAE) Athalia count cats the leaves, Hoplocampa fulcicornis attacks the grapes. Macrophya rufipes tunnels the pith of the branches.

Report for 1912-13, East Africa Protectorate.—Annual Colonial Reports, no. 791, London, Feb. 1914, p. 30.

During the year under review there was no serious outbreak of any cort pest, although new ones have been met with, and the old ones have been more or less abundant. White grubs were reported to be doing are damage than hitherto, crops on badly cultivated land being most blocked. The woodly apple aphis (*Eriosoma lanigerum*) has been found new localities, and in spite of the inspection of imported trees it has been again introduced into the country. Cut worms in mursery which have been destructive, especially in the case of tobacco. Numerous against horers have been found on the coffee plantations. A study of these was made, as the coffee industry is likely to be one of some againable. Maize to the amount of 9.866 tons was passed for export, which 628 tons were passed through the fumigating chambers.

Ромго нільку (І. А.). Очернъ распространенія въ Россіи важнѣйшихъ вредныхъ животныхъ въ 1912 году. [A Review of the spre ud of the chief injurious animals in Russia during 1912.] «Ежегоднинъ Гл. Упр. 3. и 3. по Департаменту Земледъпія.» Усиг Book of the Department of Agriculture of the Central Board of Land Administration and Agriculture,] St. Petersburg, 1913. pp. 351-361.

The author opens with a general statement that on the whole, Agreement in Russia suffered in 1912 considerably from various insect In Asiatic Russia, and also in some eastern and south-eastern paretuments of European Russia, there were outbreaks of various states of locusts, which have invaded even the province of the Don A some parts of the government of Taurida, where Caloptenus in the north and also some parts of Middle Russia, the chief pest was Enxoa (Agrotis) "1 'am. Schiff. It has been observed that these insects do not attack As on which vetches have grown during the summer; the actual cison of this is not yet known and requires further investigation. Velos have also proved very useful in combating another grass pest North Russia, viz., Chareas graminis, which, in 1912, totally restroyed the grazing in the district of Jamburg, of the government of Petersburg. Agrotis c-nigrum, which has been considered to be injurious, has done damage in the government of Vjatka, where aterpillars appeared in the first half of May on winter-sown fields, boding first on weeds and later on the crops. In South Russia residerable damage was done by Oria (Tapinostola) musculosa in the evernment of Ekaterinoslav. These pests have done more or less damage to nearly 45,000 dessiatines (120,000 acres) of crops, the loss

being estimated at about £250,000. The author refers also to Phlychi. nodes sticticalis, Eurygaster sp., Brachycolus noxius, Oscinis fra 1813 Pentodon, and gives some information as to their appearance at injurious activities. In the government of Saratov a Capsid bug, $A_{pq_{B_{1}}}$ freyi, Fieb., has been reported as injuring grain crops, while in proving, years the same pest has damaged pastures and meadows in the same localities. Coeliodes fuliginosus, Hylemyia coarctata and Aphis gassque (on cottonseeds in the government of Erivan, Caucasia) were at reported from various governments. A new Chalcid pest of clover seed in Russia, Eurytoma gibba, Boh., was discovered by Kurdjumov in so.; samples from the governments of Poltava and Kiev, and by the Bure. of Entomology (of the Central Board) in samples sent from the govern ment of Orel; by mowing the clover for seed in autumn it is possible to separate the affected seeds from the healthy ones. The autimentions that the Entomological Station of Voronezh specially studies the biology of larvae of Agriotes, while the Station in Tula conduct special studies on Apion. Amongst the insect pests of fruit gard he mentions Psylla mali, which affects the orchards of North at Middle Russia, while an undetermined species of *Psylla* is a dangerous pest in South Russia. Euthrips pyri, Daniel, is a new pest found 1912 in the Crimea on apple and pear trees. The artificial important of Pentarthron semblidis— a parasite of Cydia (Carpocapsa) pomonella into the orchards of Tashkent, which was started in 1911, has resulted in the acclimatisation of the parasites in that country. Various species of Phyllotreta have damaged market gardens, while the following perof forests were reported to the Bureau: -Agrilus vividus injured but trees in the Government of Samara; Eulecanium corni, B., appeare! on hazel trees in the government of Kazan, the pests passing afterwards to orchards; Lymantria dispar was widely spread in the forests in the mountainous parts of the Crimea, where Mokrzecki has discovered a new parasite of it - Hadronotus (Telenomus) howardi.

The author gives also the following information specially related: to Siberia, according to reports received by the Bureau from K. N Rossikov, who spent there the spring and summer of 1912. In various districts of the government of Enisseissk an outbreak of locusts took place, chief amongst the pests being Gomphocerus sibirious; the exclusters have infested an area of 100,000 dessiatines (270,000 acreand £17,500 was spent in control measures. In the same government the crops were also injured by Plectroscelis vittula, Hydroecia nichtae and by larvae of Elateridae; the caterpillars of Euxoa segetum. company with the larvae of Chortophila brassicae and Aphids, have destroyed a great number of cabbages; Hylemyia antiqua was reported as a pest of onions; Phlyetaenodes sticticalis was found over the whogovernment and in some parts has done great damage to vegetables. In the province of Akmolinsk larvae of Agriotes and of Trachea (Haden) basilinea have appeared in enormous numbers; in one locality many as 50 larvae of Agriotes were found on 61 square feet, the cross in these fields having been cleared off by the insects.

The Department of Agriculture has published, during 1912. St works on Entomology and republished five books. The author concludes by giving a list of the entomological Stations in Russis the number of which, including the Bureau of the Scientific Committee to the Central Board of Land Administration and Agriculture, is 21.

The following is a list of towns in which Bureaux exist: -Moscow, Thia. Kursk, Charkov, Poltava, Ekaterinoslav, Cherson, Simferopol, Orol. Stayropol, Vladikavkaz, Astrachan, Tiflis, Tashkent, Kishinev, K. Smiela, Voronezh, Baku, Riga, Orenburg, Kaluga, and Warsaw.

PLANOV (V. P.). Замариваніе коконовъ Нафталиновъ. [The destruction (of silkworm pupae in) the cocoon by means of Naphthalin.] « Извъстія Навказской Шелководственной Станціи » [Bulletin of the Caucasian Silk-growing Station] for 1913, Tiflis, 1913, pt. 3, pp. 1-8.

The Caucasian Silk-growing Station has made use of naphthalin same ans of destroying the pupae inside the cocoons. The advantages at this method, besides being more convenient than those already in secure that the cocoons do not lose their brilliance and colour, which not the case when the pupae are killed by means of steam. The ather has been experimenting whether it would not be possible to use apathalin also in case of cocoons which are intended for industrial superses, and how far and in what way naphthalin will affect the matries of the silk wound from such cocoons. As a result he concludes that naphthalin cannot be recommended. The minimum time constant to kill pupae by means of naphthalin is about 48 hours.

Темпенняки (Dr. J.). Experiment with Insecticides.—Отчетъ за
 1912-й годъ объ организаціи и дѣятельности станціи охраны растеній въ Варшавѣ. [Report for 1912 on the organisation and acticity of the Station for the Protection of Plants in Warsaw, 1913, 19 pp., 4 figs.

This is a report by Dr. Joseph Triebinski on the Warsaw Station. which was established in 1911, and consists chiefly of a description of the organisation of the Station (buildings, staff, library, scientific apparatus, collections, etc.) and also short records of some experiments stiducted there on remedies against fungus diseases of plants and on some insect pests. So far as the latter class of experiments is concerned, the report mentions: - (1) Experiments against Coccids on Fraxinus electrics: the smearing of the branches of these trees with (a) milk of ane. (b) "Scalecide" (15 per cent.), (c) calcium polysulphide (15 for cent. and 20 per cent.), (d) carbolic emulsion (50 cm. of carbolic and 20 grms, of soap in one litre of water), (e) carbolineum and lime 15 grams of carbolineum and 150 grms, of lime in one litre of water), f rhaphtha soap emulsion (25 grms. of liquid soap, $\frac{1}{4}$ litre of water and $\frac{1}{2}$ http of naphtha, the whole being dissolved in ten times the amount of water), and (g) 5 per cent. solution of soda; which showed that the most effective remedies were soda, scalecide and naphtha emulsion, Tone of which injured the bark of the trees.

(2) Experiments against larvae of ELATERIDAE in strawberry-beds; inseconsisted in the digging into the soil of lime, saltpetre, sulphate aton dissolved in liquid manure, and in burying trap potatoes; the results showed that while lime and saltpetre keep away the larvae from the roots of strawberries for a short time only, sulphate of iron has no effect at all, and the larvae were found in the potatoes only after the expiration of two weeks.

(3) Experiments against the larvae of *Melolontha* with ½ per cent and 1 per cent. of Schweinfurt green sprayed on the roots of trees hateralled, in nature as well as in the laboratory, as the insecticide did to affect the larvae, but injured the trees, causing the leaves to fall off.

Неудача съ яйцевдомъ плодоморки. [Failure with the paraset. (Pentarthron sembledis) of Cydia pomonella.]—«Турнестанское Сельское Хозяйство» ["Agriculture of Turkestan,"] Tashkee Dec. 1913, pp. 1198-1200.

An editorial note records a serious outbreak of Cyclia (Carpora_{peri} pomonella in the orchards of Tashkent in 1913 and the appare failure to obtain the favourable results which have been expectal from the parasites of the eggs of this pest imported from Astrachat A case of one orchard is mentioned in which a small number of the parasites were released in September 1911; they hibernated in goal condition, but developed in great numbers only at the end of the hear summer, evidently having required the first half of the summer for multiplication. In the autumn of 1912 there was not a single applin this orchard which was not infested by C. pomonella. Owing the great number of parasites which were noticed at the end of the summer, it was expected that the number of hibernating specimers would be greater and that the latter would develop and prove metuseful in 1913; but it appeared that the number of parasites in 1915 was very small, while the numbers of C. pomonella were enormor-The writer of the article is at a loss to explain the reason for this failure and suggests that either the parasites themselves destroyed lasummer all the eggs in which they could have wintered, or that the have been removed from the orchard with the harvest of apples In view of the serious injury done to the orchards of Tashkent by the pest and to the failure or cost of other remedies, it is suggested that evidently the parasites must be bred artificially in the laboratory of the Entomological Station and let loose in the orchards early in spine

A Suggestion for trapping Pachydissus sartus.— « Туркестанское Сельское Хозяйство» ["Agriculture of Turkestan,"] Tashko: Dec. 1913, pp. 1226-1228.

A correspondent suggests as a remedy against the Longicor. Pachydissus sartus, Sols., the use of trap trees, the bark on some parts of which has been removed to expose the wood. He contends that such trees would attract the beetles, and could be destroyed as seen as they had become infested. This method is successfully applied against various Scolytide. In a reply, V. Plotnikov does no approve of this method under the conditions prevailing in Turkestal where there are no large forests. Besides he is not satisfied as to the suggested method of preparing the trap trees, for his experience has proved that these beetles are not attracted to rings on trees made have moving the bark; and even if the trees should be cut down and leftlying, he doubts whether they would attract the insects in sufficiently large quantities. Pending further investigations, he repeats he previous recommendations, i.e. to remove and burn the damages trees before the spring and again later in the season.

KULIGIN (N. M.). Главивный вредныя насвионыя для полеводства въ Европейской Россіи въ послъднее двадцатильтіе. [The principal Insect Pests of field-crops in European Russia for the last 20 years.]—Емегодникъ Гл. Упр. 3. и 3. по департаменту Земледъпія. [The Year-book of the Department of Agriculture of the Central Board of Land Administration and Agriculture], St. Petersburg, vi, 1913, pp. 585-638, 1 plate.

The author reviews in this article the appearance and distribution of and damage done by the principal insects injurious to field-crops for the past 20 years in Russia, together with the more important measures for fighting the pests undertaken by the Zemstvos. He first deals with Anisoplia austriaca, Herbst, and gives a table showing the years of the appearance of this beetle in 25 different governments of South and Middle Russia for the period 1894-1912. It appears that this insect is a constant pest in the governments of Cherson, Taurida, Ekaterinoslav, Kiev and Charkov, while in most other parts, even in South Russia, it occurs much less frequently. In some years, such as 1897, 1900, 1901, 1910 and 1912, the inserts appeared over a very wide area; while in other years, such as 1904-1907, only five governments complained of their depredations. In some districts the beetles appear during a number of successive years, but most frequently there is an interval of 2-3 years in their appearance in the same area, while in other cases-Bessarabia, Stavropol this interval reaches 7-8 years.

Mayetida (Cecidomyia) destructor, Say, has been noticed in 41 governments, a list of which, with the years of the appearance of the pest, as supplied. It appears that it has been found as far north as Pskov (1894 and 1904) and Viatka (1898) and in most parts of Middle and South Russia, but the damage done by these files is more constant and chronic in the southern governments, while the outbreaks in Middle Russia and in the north take place at longer intervals. As a rule their multiplication depends a great deal on the meteorological conditions of the spring and autumn, a rainy spring engrap favourable for their development; but the author points out the years which proved exceptional in this respect.

themis frit, L. Records are given of the appearance of this pest 21 governments, from 1894 to 1912, as well as information as to threaks since 1837, when one took place in Kurland. In Bessarabia is fly is considered to have been the chief pest of field-crops during cent years. The author mentions the fact that only in those governments where there are entomological organisations is the damage by see insects kept on record separately from that done by Magetiola structor. As a rule these two flies become abundant in the same ears, although contrary cases are also known. It is stated that frit sometimes appears persistently in a limited locality, as is the se in the experimental fields of the Moscow Agricultural Institute, here they cause considerable damage every year.

Cephus pygmaeus, L., and C. tabidus, F., have been recorded in 26 wernments, and a table is given with information as to their appearace in each year from 1893 to 1912. They are more injurious and 25 Wt.P.86,37—24 14. 1500. 4.14 B.&F.Ltd. Gp.11/3.

appear more frequently in some southern governments (Cherson Taurida, Ekaterinoslav, Charkov). The damage caused by these peats is variously estimated at from 14 to 20 per cent., although there are cases in which the damage was much more serious. In 1911 in the povernment of Kiev, these insects only attacked fields already damaged by M. destructor.

Euroa (Agrotis) segetum, Schiff. Records have been compiled if the appearance of this important pest in 34 governments, it being four. I as far north as Vologda, St. Petersburg, and Viatka, where it as noticed in 1838. In the government of Tula the caterpillars have appeared in great numbers every year from 1901 to 1910, with a subject decline in 1907. The intervals between the years of maximum occur rence vary in different parts of the country. Sometimes the peace do little damage, although appearing in great numbers, as was the case in Tula in 1910.

Oria (Tapinostola) musculosa, Hb., is a South Russian pest; first the table supplied it appears that it has been observed in 10 governments. The intervals between outbreaks are considerable.

The author deals in the same way with Locusta (Pachtylus) mentoria, L., and various other species of locusts; also with Thrips (white are tabulated for 18 governments); the Pentatomid bugs, Eurgy: maura, F., E. marrocana, F., E. integriceps, Osh. (in 11 government; mostly in South Russia); the Elaterid beetles, Agriotes segetis, Bjeta, and Athous niger, L. (in 19 governments); Hydroceia nictitans, Exit (in 14 governments of South and North-east Russia, the most frequent outbreaks having occurred in Ufa); and with Lema melanop. L., which is recorded from 9 governments of South Russia.

With regard to the general factors influencing the occurrence at periodicity of insect pests, the necessity for further research is empire mised. The first Zemstvo to appoint an Entomologist was that Taurida in 1893, Cherson being the next to follow this example: 1897. Some Zemstvos while not having a permanent Entomologia Station, invite yearly the services of specialists or apply to the Centra Government for such men. Other Zemstvos assign this task to the "agronomists," who give popular lectures to the peasants on various insects and remedies for them, with demonstrations, leaving the actual combating of the pests to the public, though in some cases they also supervise the technical part of the campaign. The author proceeds to review other activities of the Zemstvos, so far as the first against insect pests is concerned, which include :- bye-laws regularity the campaign against any particular pest; the issue of posters, pampa lets, etc., acquainting the public with the various aspects of this que tion: the supply, sometimes on advantageous terms, of sprayers insecticides, fungicides. tanglefoot, etc., to the public; subsidies " various Agricultural or Natural History Societies; the payment of premiums for the collection of various pests, etc.

The author gives a list of the literature used by him for his rever and goes on to describe more fully the control measures against $E^{1/4}$ segetum, Mayetiola destructor, and Anisoplia austriaca.

Lecalleon. Sur la fécondité du Négril des luzernes (Colaspidema atra, Latr.). [On the fecundity of Colaspidema atra, Latr.]—C. R. Acad. Sci., Paris, clviii. no. 2, 12th Jan. 1914, pp. 137-139.

The small beetle, Colaspidema atra, Latr., called in France "Négril," on account of its black colour, causes serious damage every year to lucerne crops in the neighbourhood of Toulouse. It is common in other parts in the south of Europe. In May and June the hibernating adults appear, and soon after the larvae are found in the fields of lucerne. The present paper deals with experiments made to determine the number of eggs laid by the female during her lifetime, and the results indicate that a single female may lay almost 1,000 eggs from April to June. This degree of fecundity was maintained both when fertilisation occurred only once or was repeated several times. The degree of fertility in different individuals was very variable.

LCHBORN (W. A.). The Relationship between certain West African Insects. -Trans. Entom. Soc. London for 1913, London, iii. 21st Jan. 1914. pp. 436-524, 4 pl.

The observations recorded in this paper, upon the relationship between certain insects, were made at Oni, in Southern Nigeria, in a bush camp, situated 70 miles E. of the town of Lagos and about 10 miles from the sea. Although most of the work done is of purely scientific interest, certain points are noted which are of economic importance. The larvae of three Lycaenid butterflies, Aslanga vininga, Hew. A. lamborni, Bethune-Baker, sp. n., and Spalgis lemolea, H. H. Druce, were found to feed on Coccids; and the same habit is recorded of the larvae of two moths, Eublemma ochrochron, Hmp., and Tortrix callopista, Durrant, sp. n.

In an account of the Homoptera (PSYLLIDAE and COCCIDAE) collected by Ma Lamborn, Prof. Newstead describes a new species of Psyllid, thmopsylla lamborni. The Coccids collected were Stictococcus sjöstedt. Newst., one of the recognised cocoa pests of Western Africa, Prochamorus (Dactylopius) longispinus, Targ., P. virgatus var. madapuscuriensis, Newst., and Lecanium punctuliferum, var. lamborni, var. n.

Braucher (R. W.). An Undesirable Foreigner on the American Continent (Cryptococcus fagi, Baerens).—Canad. Enton., London, Ontario. xlvi, no. 1, Jan. 1914, pp. 14-15.

The author received, in October 1913, specimens of bark from a common beech tree covered with an insect which was stated to be noticeable all through the woods in the vicinity of Halifax, N.S. Dr. Howard identified it as the European felt scale (Cryptococcus fagi, Baerens). In Britain this insect confines its attacks to the beech (Fagus sylvatica), the copper beech being all but immune. The specimens from Nova Scotia are doubtless from the American beech (F. grandifolia, Ehrh.), an entirely new food-plant, and prompt measures should be taken for its extermination, since it would appear that the insect is taking well to its new conditions. This seems to be the first record of the occurrence of this Coccid in North America.

HEWITT (C. G.). Note on Occurrence of the Felted Beech Coccus (Cryptococcus fagi, (Baerens) Dougl.) in Nova Scotla.—Canadica Entomologist, London, Ontario, xlvi, no. 1, Jan. 1914, pp. 15-16.

Dr. Hewitt, after reading Mr. R. W. Braucher's article on Cryptococcus faqi, notes that in August 1911 specimens of the felted beech Coccid, C. fagi, were sent to him by Mr. Justice Meagher of Bedford N.S. Investigation then showed it to be present on both ornamental and forest beeches in the neighbourhood of Halifax, where it has existed for years, Mr. R. Power, Superintendent of the Public Gardens Halifax, having known it for twenty years. Efforts should be made to prevent its spread. Theobald has found the Woburn Wash of Mr. Spencer Pickering to be a most successful remedy. This is made as follows: -Soft soap, ½ lb.; kerosene, 5 pints; caustic soda, 2½ lb.; water, 91 gals. The soap is dissolved in hot water, then the oil mixed in, then the soda, and the whole brought up to ten gallons with water An effective summer wash is made by boiling together 8 lb. soft soat and 5 gals, of kerosene. On cooling this becomes a jelly, and for use 10 lb. of the jelly is added to 30 gallons of water. The best results have been obtained by scraping off the Coccids and scrubbing with the kerosene wash.

Meeting of the Entomological Branch, Ottawa Field Naturalists' Club
Ottawa Naturalist, Ottawa, xxvii, no. 10, 30th Jan. 194;
pp. 135-139.

At the meeting of the Entomological Branch held on 8th Jan. 1914 some oak twigs were shown from Meach Lake, Que., from which has been reared the Cerambycid, Elaphidion parallelum. The larva tume-the twigs for several inches and pupates in them, finally emerging through the base of a broken twig. This beetle is related to the Oak Twig Pruner, Elaphidion villosium, which was injurious to oaks in the St. Lawrence Island Parks in 1912 and 1913. The habit of the latter species is to girdle the twigs, causing them to drop.

Another subject discussed was the habits and life-histories of the various species of June Beetles (Lachnosterna); it was stated that the distribution of the various species is often quite local, owing to each havez preferences in matters of soil and moisture in their breeding place. When hibernating some species remain at a depth of less than a fee below the surface of the soil, while others have been found at depth varying from 47-91 inches. Mention was also made of the remarkable manner in which skunks seek out the larvae for food, thereby door much good.

Grove (A. J.). Some experiments with Maize stored in bins.— Art. Jl. of India, Calculla, ix, pt. 1, Jan. 1914, pp. 92-98.

In October 1912 some experiments were started to test methodfor protecting stored maize, kept for feeding cattle, from the attack of insects. The grain to be treated was kept in large cylindrical bins. One bin contained maize which had been fumigated with carbon bisulphide; a second, maize that was unfumigated, but in which naphthalene was suspended in muslin bags; in a third the maize was fumigated and naphthalene was also used. A fourth containing infamigated grain and no naphthalene served as a control. The insects found were Rhizopertha dominica. Tribolium ferrugineam, and Calandra cryite: of these T. ferrugineam is harmless, living merely in the dust amongst the grain. The results show that storing with naphthalene it practically as effective as funigation with carbon bisulphide: that it has no bad effect on the grain from the point of view of its suitability as food for cattle and that it does not alter the germinative capacity to any appreciable extent. It has the following advantages over funigation with carbon bisulphide:—It is easy to use, and is less dangerous, no special apparatus being necessary; the cost is less and the effect is continuous, whereas carbon bisulphide must be allowed to evaporate and any insects which gained access to the grain after that would breed unchecked.

In the experiments described, flake naphthalene was used at the rate of 1 lb. per bin, the bin being 6 ft. high and 3 ft. in diameter, holding between 25 and 30 maunds (2,000-2,400 lb.) of maize. The naphthalene was divided into four parts, each of which was wrapped in a muslin is a and suspended at different levels in the bin. It is important that the naphthalene should not mix with the grain, and before feeding the grain to cattle it should be exposed to the sun for from 6 to 12 hours.

ADCOCK (G. H.). Phylloxera. Jl. Dept. Agric. of Victoria, Melbourne, Mr. pt. 1, Jan. 1914, pp. 51-55, 3 figs.

An account is given of the habits and life-history of *Phyllorera* estatrix, with an historical description of its discovery in America and its introduction and spread in Europe. In 1875 it was introduced accidentally into Victoria in some vines imported from Europe; the first attacks were noticed near Geelong. Under legislative authority whole areas of vines were destroyed to annihilate the pest, but in spite of this further attacks occurred in the Bendigo, Goulburn Valley and Rutherglen districts, where similar measures were taken, but with as attle success. These attacks caused a considerable set-back to the apportant industry of viticulture in Victoria; it is, however, steadily recovering, owing to the reconstitution of the vineyards with American resistant vines.

Homell (A.) As Cigarras do Cafeeiro. [Coffee Cicadas.]—O Falendero, S. Paulo, vi, no. 3, March 1913, pp. 92-93, 6 figs.

The author figures and briefly describes Fidicina pulluta, Berg, and tracks fusciculata. Ger. These two species occur together in Brazil, though the former is more numerous in Caconde and the latter in tanginas and Itatinga. They were first noticed by coffee-planters in 1801 in Caconde, and have since been recorded from various widely esparated localities in the State. On uncultivated land the insects field, in their larval and nymphal stages, upon the roots of indigenous ties. When the bush is cleared and coffee planted on the same ground, for hymphs speedily adapt themselves to the new conditions and feed from the roots of the coffee trees, doing considerable damage. It is becommended that when the presence of cicada nymphs is suspected the soil should be turned over round the roots of the coffee.

La Langosta. [Locusts.] -Bol. Fomento, San José, Costa Rica, in. no. 11, Nov. 1913, pp. 830-831.

The following experiment was made in Nicaragua upon a swarm of locusts which covered an area of 500 yards by 200 yards. This swarm had proceeded in a solid column eating up everything which a encountered in its path. A poison was prepared with 1 lb. of arsenatof soda mixed with 4 lb. of brown sugar and dissolved in a large vessel of boiling water; cold water was then added in a quantity sufficient to make 10 gallons of the solution. Six good handfuls of green barley (any other sort of green fodder may be used), weighing altogether 36 lb., were dipped in the arsenical solution for 15 or 20 minutes until completely saturated. The poisoned barley was then distributed over the greater part of the swarm. The first effect was to stop the advance. The locusts attacked the bait with great voracity, consuming the whole of it. The next morning the few that were not dead were intoxicated and died quickly when sprinkled with a little of the solution. The living, as usual, ate the dead and large numbers were killed in this way. In about four days the whole swarm was destroyed The author notes that a number of birds which ate the poisoned locus. did not appear to be in any way affected.

GORKUM (Dr. N. van). Dactylopius sacchari brasiliensis. —Bidetin 4. Estaŭco Experimental de Canna de Assucar de Escada, Estado de Pernambuco, Recife, i. no. 1. April-June 1913, pp. 29-31. 1 pl.

This scale-insect is found in various stages of development chief, on that part of the stem of the sugar-cane which is just below the surface of the soil and on the crown of the roots. The bugs also crawl up the stem and attach themselves to the underside of the leave, preferring the young shoots. The presence of the insect is indicated by the intense red colour which the leaves acquire at their base. The scale will live on any species of cane, even on Saccharum spontage as a wild species, and the damage done is such as to interfere great, with the growth of the plant. Any direct and radical remedy is verifificult of application, because the bugs tend to collect between the stem and the leaves, and the latter cannot be removed without damage to the plant. The best remedy is to disinfect the cane thoroughly before planting with Bordeaux mixture, which kills both the bugs at the eggs.

The author thinks it possible that the various species recorded from sugar-cane in different parts of the world are possibly only varieties of one species, and in order to distinguish the insect which is himself has dealt with and which was found for the first time in the State of Sergipe, he proposes to call it Dactylopius sacchari brasilies sub. sp. nov., a brief description being given.

Plagas de la Agricultura. | Pests of Agriculture. | --Bol. Minist. Asc. Buenos Aires, xv. no. 5, May 1913, pp. 520-521.

A table is given showing the destruction of locusts in the variest provinces of the Argentine, from which it appears that 2,381 tons i insects were destroyed in the month of April 1913.

Brown (A.). Monografia Sobre el Cultivo del Algodon en la Republica Argentina. [The cultivation of Cotton in Argentina.] - Reprint from Bol. Minist. Agric. Buenos Aires, 1913, 22 pp.

The author mentions that although there is nothing which can be called a serious pest of cotton in the cotton-growing districts of the Argentine, yet the cotton worm, Alabama argillacea, is fairly common, but can be easily combated by the use of Paris green in powder at the rate of 1 to 2 lb. per acre.

SALVADORES (A. Z.). El Durazno. [The Peach.]—Reprint from Bol. Minist. Agric. Buenos Aires, 1913, 33 pp., 56 figs., 17 pls.

Amongst the pests of peaches in the Argentine, the author names 1 bicospis pentagona, and recommends for its destruction neutral Acaroina. 41 per cent, solution in summer and 15 to 20 per cent, in winter. Calcium sulphides may also be used in winter, being prepared by boiling 12 lb. of time in 4 gals, of water and adding 8 lb. of sulphur in powder: 4 gals, of water are then added, and the whole boiled for two hours. Both preparations should be laid on with hard brushes, but sprayers may be used for the upper parts of the trees. Attempts are being made to acclimatise certain enemies of the scale, especially the Coccinellid, Rhizobius lophantae, and various Chalcids of the genus Prospeltella. There is a native Coccinellid (Coccidophilus citricus) which is generally to be found in summer on lemon and orange trees in the province of Buenos Aires, and appears to feed upon Lepidosaphes which is a pest of these plants. It has also been observed o have a predilection for Aulacaspis (Diaspis). The artificial propagation of this insect is advocated.

Aphis persicue (the peach aphis) attacks the tender shoots and leaves, killing them and thereby causing the death of the tree. It can be controlled by spraying the affected parts in spring with a 5 per cent. extract of tobacco. The operation should be carried out in the evening and again on the following morning. The tree should subsequently be sprayed with water in order to remove the nicotin. A 5 per cent. solution of lysol with 0.6 per cent. of soft soap in water may also be used. It is useful in winter to brush the trunks of the principal branches with milk of lime. The plants that have been attacked in the previous spring and summer, and especially the ends of the one-year-old branches, should be washed in every part with a 3 per cent. solution of soft soap. It is also desirable to collect and destroy the tips of badly attacked branches, and all trimmings and prunings.

An Act Respecting the Protection of Plants from Destructive Insects and Fungoid Diseases.—Quebec Assembly Bill, no. 32, 1913.

Under this Act the Entomologist of the Department of Agriculture of the Province of Quebec is given the right to enter any nursery, orchard, or other premises where it is believed that plants are kept, and any resistance to this action is forbidden. The existence and spread of any insect pest must be reported, and all instructions regarding the treatment or destruction of infested plants must be carried out by the owners. After the Entomologist has ascertained the existence in a nursery of any one of the pests enumerated, no plants may

be removed from that nursery until a certificate stating that they are fit to be transferred has been obtained from the Entomologist or his assistant. The Minister may authorise certain persons, for scientific purposes only, to import specimens of the destructive pests No compensation for expenses incurred or damages suffered through the treatment or destruction of any plants, trees, or other vegetable matter attacked by any of the destructive pests shall be allowed by any court when such expenses result from the instructions of the Entomologist. Among the destructive insects to which this section applies are expressly included the San José Scale (Aspidiotus permiciosus, Comst.), the brown-tail moth (Euproctis chrysorchoen, L.1. the gipsy moth (Lymantria (Porthetria) dispar, L.), and the woolly aphis (Schizomeura lanigera, Hausm.) Between the 15th June and the 15th September of each year the Entomologist or his representative shall visit all nurseries in the Province in which plants are grown for commercial purposes, in order to ascertain the existence in such nurseries of any of the destructive insects or plant diseases, and if such insects are not present a certificate shall be issued which is valid up to the inspection next year. Unless such a certificate is obtained after the 15th December 1914 every owner or person in charge of a nursery in the Province is forbiddedn to move any plant outside the nursery.

PATCH (E. M.). Woolly Aphid of the Apple.—Maine Agric. Expt. No., Orono, Bull. no. 217. Oct. 1913, pp. 173-118, 6 pls.

This Bulletin is practically identical with Bulletin 203 [see this Review, A, i, pp. 24-26].

PATCH (E. M.). Woolly Aphids of the Elm.—Maine Agric. Expt. No., Orono, Bull. no. 220, Nov. 1913, pp. 259-298, 6 pls.

The author deals with the elm aphids of the Eastern United States belonging to the genus Schizoneura. Among the points of specific value in separating these aphids are the antennae of the stem females. the wax glands of the apterous generations and the antennal characters of the winged females. The habitat and the species of the elm concerned are also of much significance. Among the species considered in this bulletin is the woolly aphid of elm bark, S. rileyi. It is not uncommon to find the trunks and branches of young elms with the tender places in the bark closely packed with colonies of this species. Descriptions of the distinguishing features of the different generations are given, the antennae especially being described and illustrated. Elm rosette or leaf-cluster aphid, S. lanigera, and the northern curl of American elm, S. americana, are here treated separately, though the author states that there seems to be no ground for separating the two except the nature of their elm habitat [see this Review. Ser. A.). pp. 24-26.] The author also notes that the life-cycle of the leafroller of elms. S. ulmi, includes a residence on the roots of currants and gooseberries, the form which occurs on Ribes being known as S. fodiens. Specimens identical with S. nlmi (fodiens) have been collected in California, Oregon, Maine and Ontario.

The Bulletin concludes with a food-plant catalogue of the APHIDIDAE of the world.

FIGURER (T. B.). List of Insect Pests of Cultivated Plants in Southern India.—Madras Dept. Agric., Coimbatore, note no. 1 of 1913. 8th Oct. 1913, 15 pp.

This is a list of the principal crop-pests of Southern India, and contains information regarding 275 different species, giving their distribution, the crops they attack, and remarks as to their relative importance. The list does not purport to be complete, as new pests are constantly coming to light. The insects dealt with are referable to the following orders:—Hymenoptera 5 species, Coleoptera 61 species, Diptera 8 species, Lepidoptera 119 species, Rhymchota 64 species, Orthoptera 15 species, Isoptera 2 species and Thysanoptera 1 species, It should prove a very useful pamphlet, and the tabular arrangement adopted is very handy for reference.

Mol.z (E.) Chemische Mittel zur Bekämpfung von Schädlingen landwirtschaftlicher Kulturpflanzen. [Chemical means of combating pests of cultivated plants.] Zeits, Angewandte Chemic, Leipzig xxvi, nos. 77 & 79, 26th Sept. 1913 and 3rd Oct. 1913, pp. 533-536, 587-588.

The paper deals with the chemistry of insecticides and fungicides, the action of chemicals upon insects and parasitic plants and on the host plant, and with the possible risks of injury to man or animals by the use of these substances.

Copper sulphate, which has long been used as a fungicide, has only of recent years been regarded as a useful insecticide. GUILLON in central and southern France found that a copper-lime mixture was effectual against grasshoppers, and in 1911 the author, as the result of direct experiment, found that the same mixture protected foliage from the attack of caterpillars; in both cases the effect being due not to the line, but to the copper salt. It was found that solutions containing less than 2 per cent, of copper sulphate were useless, to which fact is attributed the failure in certain cases to destroy pests with this preparation.

Sulphur is a useful remedy against many insects, especially against ted spider (Tetranychus) and flea-beetles, e.g. Haltica ampelophuga, upon which it acts not only as a direct poison but as a repellant. In some cases this has had the undesired effect of driving away insects which are useful in destroying harmful insects, as in a case observed by the author when the application of sulphur to vines to rid them of the vine moth resulted instead in the destruction of the earwigs, a natural enemy of these pests. Sulphur is often applied in the form of a polysulphide of potassium (K 2 S 3), the liver of sulphur of commerce. Liver of sulphur must not be used stronger than I lb, in 20 gals, of water, otherwise the foliage is damaged. The author prepared a very satisfactory mixture as a remedy for red spider by adding 23 per cent. of soft soap to the liver of sulphur mixture, whereby the efficiency was greatly increased. More important than liver of sulphur 15 the lime-sulphur mixture. In America this has proved a valuable remedy against the San José scale (Aspidiotus perniciosus), and has been used successfully in Germany, where it is known in commerce as "Californische Brühe." It is prepared by boiling a mixture of

burnt lime and powdered sulphur in a small quantity of water; in concentrated solution it is a brownish-yellow liquid, and can be easily diluted with water. The quick lime, sulphur and water are boiled in an iron vessel. The formula used in America is as follows: -1 part by weight quicklime, 2 2.25 parts sulphur and 9-11 parts water. The lime must be as pure and as fresh as possible, otherwise it contains a large quantity of carbonic acid, which renders it useless. As a byproduct calcium thiosulphate (CaS,Oa) is formed, which is soluble in water, but which, on standing in the air, precipitates as insoluble calcium sulphite (CaSO.) and free sulphur; the calcium sulphite remains at the bottom of the vessel and the sulphur enters into fresh combination with the lime. Lime-sulphur mixture may be prepared either in the concentrated form or ready for use. In the former case 42 lb. sulphur and 19 lb. lime are used to 22 gallons water. For winter spraying the proportions are 8 lb. sulphur and 101 lb. lime to 22 gals. water. The hoiling should not last over an hour. When the liquid is cool its specific gravity is tested by means of a Beaumé's hydrometer. In America the commercial product is 32 34° Bé., in Germany usually 20 Be. The mixture should be used as soon as possible, but it may be kept in well-closed vessels for a month. Contact with the air causes precipitation of reddish brown crystals of the pentasulphide and tetrasulphide of calcium.

Carbolineum is now recognised as a universal remedy against insect pests, as a result of much experimental work done notably by Aderhold, Hiltner, Lüstner, Schander, Fulmek, Zimmermann, Wahl and Schwartz, Carbolineum is a distillation product of coal or wood tar. Soluble carbolineum is prepared in commerce in many forms and under various names. Netopil (1909) showed that the commercial products differed widely in their chemical and physical characters. and Aderhold and Lüstner showed that some of these products were actually harmful instead of beneficial to plants. With the purpose of ascertaining what in such products were beneficial and what harm ful, the author conducted some experiments in 1909 and 1910 in the Flörsheim chemical works. In these experiments 30 different tar-oils were tried, including raw tar-oil, phenol-free tar-oil, base-free tar-oil, phenol and base-free tar-oil, raw base and raw phenol from tar-oil. Of each kind of tar-oil, 2 light oils, 3 medium oils and 2 heavy oils were tried. The results were shortly as follows. Insecticidal action is most marked with light oils. Aphids were killed by all the oils. but the oil entered into the galls and destroyed the adjoining tissues; this was less marked in the case of heavy oils than with medium or light oils. Soluble tar-oil can be used in 10 per cent. solution against Aphids, but it must not be allowed to touch the green parts of the plant. Against caterpillars the best results were obtained with the bases and phenol from the tar-oils. A 5 per cent. solution in water of raw phenol is sufficient to kill caterpillars of Pieris brassiene. the efficiency rising with the concentration. Green parts of plants are sensitive to a 0.5 per cent, solution, so that carbolineum is only really satisfactory when used before the trees are in leaf. For killing insects in the ground light oils were the best, but these were only satisfactory for insects near the surface of the soil. Damage to foliage is greater in the case of heavy oils than of lighter oils, and of all the constituents of tar-oil the phenol is the most harmful to plant tissues.

Soap is an important contact insecticide, and most contact poisons contain it in greater or lesser proportions, such as, for example, quassiasoap mixture, Dufour's worm poison and Nessler's remedy for Aphids. The most essential character of a contact poison is its power to soak into the hairy or waxlike covering of insects. This power depends, according to VERMOREL and DANTONY (1910), on the surface tension of the liquid used; this can be measured by counting the number of drops formed by 5 c.c. of the liquid when passing through a pipette that allows 5 c.c. of distilled water to pass out in 66 drops. For beetles, such as Haltica ampelophaga, Rhynchites betuleti and Adoxus vitis a soap solution of strength 5: 10,000 is sufficient to kill; this strength corresponds with a surface tension of 192 drops for 5 c.c. of the liquid. For the webs of Hyponomeuta a solution of 1: 1,000 must be used. The addition of soap to insecticides is principally to increase their power of moistening the coat of the insect; to mixtures which contain acids or inorganic salts it is useless to add soap, as the latter will be precipitated.

Nicotin is an important ingredient in many insecticides. In the form of tobacco extract it is an important contact poison; more recently it has been found to be an efficient stomach poison and has been used successfully against Clysia ambiguella and Polychrosis terms.

Still more important than nicotin as a stomach poison is arsenic, in the form of Schweinfurt green and lead arsenate. The question as to whether the fruit is poisoned on trees treated with arsenic compounds has occupied attention; probably there is no risk, as the spraying is carried out, in the case of vines, for example, early in the year, and by the time the fruit appears all traces will have been washed away, or what little remains will be in such minute quantities that it can be eaten without harm resulting.

The paper concludes with an account of fumigation with hydroevanic acid, as practised in America.

Suchaeov (N.). Біологія восклицательной совки и озимой по наблюденіямь вь Тульской и Тверской губ. вь 1909-1910 годахь. [The biology of Feltin (Agrotis) exclamationis, L., and of Eason (Agrotis) segetum, Schiff.. according to observations in the Govts. of Tula and Tver in 1909-1910.]—Published by the Entom. Sta. of the Astrachan Soc. of Fruit-growing, Gardening, Market-Gardening and Field Cultivation. Astrachan, 1913, pp. 17, 1 fig.

These observations on Euroa segetum and Feltia exclamationis were conducted in the district of Novotorzhok of the government of Tver and in the district of Bogoroditzk of the government of Tula. In Novotorzhok the moths of both species were on the wing from 3rd July to 2nd August, the maximum being reached about the middle of July. In the government of Tula the flying of the moths started, notwithstanding the cold weather prevailing, on 4th June, reached its maximum on 2nd July and decreased after 28th July. The numbers of E. segetum decreased in the first half of July and the females contained fewer eggs: while F. exclamationis increased at this time, and the majority of females contained their full complement of eggs. Of the moths captured from 29th June to 7th July, 36 per cent. were F. exclamationis and 64

per cent. E. segetam; while of the latter 41 per cent, were females, and of the former 36 per cent. In the second generation the proportion of F, exclamations was only 15 per cent.

The principal weeds on fallow fields in the district in Tver, where they are not used for pasture, are: Polygonum convolvables, Circum arrense, Souchus arrensis, Atriplex taturicum, Rhinanthus cristagail, and various species of *Plantago*. In the area in Tula the fallow land is used for pasture and the principal weeds are: "Polygonoum accordare" Malra rotundifolia, Rhinanthus crista-galli, Artemisia campestres Convolvalus arcensis, Linaria valgaris and various species of Cardans In nature the moths oviposited on all weed grasses, except R. exista. galli, which is apparently avoided on account of its hairiness. Oviposition lasts from 18 to 34 days. E. segetim starting earlier than F. exclamationis. In Novotorzhok the development of the caterpillars lasted 63 days for F. exclamation is and 68 days for E. segetum; while in Bogoroditzk the figures were 51 and 46 days respectively. There were two generations of the moths in the government of Tula, although the author is not in a position to say that this is permanently the case. in the year of observation there was an exceptionally early spring which accelerated the appearance of the wintering generation and the development of its descendants. Of the hibernating larvae obtained by the author only 8 per cent, produced moths; of the remainder about 74 per cent, were killed by parasites and fungus diseases,

Very few parasites of the insects were obtained in Novotorzhok, where most of the caterpillars of the preceding autumn had perished from flacherie and muscardine; this was also the case in 1969. The species recorded are two Ichneunionids, Anomalon sp., bred from a pupa of F. exclamationis, and Paniscus gracilipes, Gr., reared from caterpillars of both species in August; and one species of fly, Tachina largurano. L., reared from caterpillars of F. exclamationis.

In the government of Tula most of the caterpillars perished from parasites and only a small proportion from flacherie. The following figures are given: Ichneumondae: 12½ per cent. of the caterpillars were infested by Paniscus gracilipes, 28½ per cent. by Henicos pillas merdarius and Ambliteles vadatorius, and 3½ per cent. by Exclustes agrotidis. Kok., sp. nov.; Tachinidae: 17 per cent. by Gonia capitata and Chephalia bucephala, and ¾ per cent. by Tachina larvarum: 12 per cent. by fungus diseases. Exclustes agrotidis has been identified by Kokujev as a new species, and the author gives a description and figures of the imago, larva and cocoon: the larva develops inside the caterpillar of the host and leaves it for pupation, which takes place in earth. The parasite has two generations during the summer and is found constantly on flowers: it parasitises also the caterpillars of Chloridea dipsacea, 1.

The author mentions also another parasite which he reared from a caterpillar of F, evclamationis in the government of Saratov; this being a Braconid, Amicroplus (Macrocentrus) collaris, sp. n., 50.490 larvae of which breed inside one caterpillar of the host; the larvae pupate in the earth; these parasites appeared on the 31st May. Pospielov reports them also from the government of Kiev.

KULAGIN (N. M.). Вредныя настномыя и мтры борьбы съ ними. [Injurious insects and methods of fighting them.]—Second revised and considerably enlarged edition. Моссов, 1913, 783 pp.

Those who have to deal with Russian Economic Entomology will he grateful to the author for providing a mass of detailed and well arranged information on the subject and an excellent guide to the insect pests of crops over a vast extent of country, embracing wide variations of climate and local conditions, and in which the unit of area of individual crops is more easily reckoned by square miles than by acres, while the damage done by certain pests in a single season would be equivalent to the virtual wiping out of that crop in several English counties. A series of lectures, delivered by the author at the Moscow Agricultural Institute, form the basis of the book and in accordance with the programme of these lectures the author has more or less confined his attention to the pests of field crops, orchards and gardens, dealing only with the more important forest pests. In this, the second edition, the number of insects dealt with has been very greatly increased and the information regarding each enlarged, and brought up to date. As the book deals with the subject from the Russian point of view and is intended for Russians, the author has elsely relied on Russian entomological literature, local conditions being as he insists, the principal factor to be considered in fighting an insect pest. A number of remedies are dealt with, the real efficaciousness of which is still not proven, but which may nevertheless altimately be of value. The author has advisedly made use of the lest known scientific names, despite the fact that many of these are no longer held to be correct, on the ground that by so doing he has worded the confusion which would inevitably have arisen had be endeavoured to incorporate the recent frequent and rapid changes in somenclature.

The subject matter is arranged under the insects in their systematic order, descriptions being given of the various groups, families and general while the individual species are dealt with most comprehensively. The last part of the book is devoted to a general review of the scientific methods of fighting insect pests. Chief amongst the latter the author puts the organisation of Entomological Stations, and he quotes from the report of a special committee, which, under his chairmanship, investigated the question of the objects and duties of such Stations, and reported thereon to the Moscow Zemstvo in 1912. The authors of this report dwell upon the intimate dependence of various pests upon the geographical position of a locality, its meterological conditions, and the methods of agricultural economy and field cultivation prevailing therein; it is also pointed out that these conditions may be very different even in closely adjoining areas, so that an exhaustive study of these factors is necessary, and the results obtained in the laboratory must be checked by observations under patural conditions. The Stations must also educate the population by means of lectures and popular pamphlets, and by sending collections of insects to elementary schools, agricultural societies, etc.; they should further warn the public as to the possibility of an outbreak of various pests. Among other scientific methods of fighting injurious meets are mentioned crop rotation and the cultivation of the soil at times and in a manner best suited for this purpose. The value of breventive methods is also insisted upon, such as precautions when buying seeds and seedlings, careful attention to the bark of trees in orchards and gardens underneath which many insects pass their winter, etc., and assistance on the part of man to different enemies of insects, such as birds, parasites, fungus diseases, etc. The author deals at some length with the question of the useful services rendered by birds in destroying insects and quotes a report on some investigations of Pomeranzev and Shevirev, from which it appears that in the stomachs of various birds are found mostly insects of the order Coleontera, next in order being Hemiptera. Hymenoptera (ants), Orthoptera Diptera and Lepidoptera; Neuroptera are seldom found. The author further discusses the work done on this subject by Baron von Ber lepsch in Germany and suggests the necessity of regulations calculated to protect useful birds. In his opinion birds are not able to control an insect pest after it has become abnormally abundant, as their capacity for destruction is limited, but they may sometimes prevent such outbreaks. The protection of birds can be accomplished by means of special regulations as to shooting and trapping, by the control of industries connected with the preparation of birds' skins, and by educating the public in this direction.

The indices are particularly useful and consist of an index of generic names, an index of Russian popular names (450) and a general index with special reference to insecticides. When it is considered that no less than 278 insect pests are dealt with and that the information given in each case is practically exhaustive from the author's standpoint, it is a matter for regret that the language in which it is written prevents a most useful and practical book from being generally accessible to Economic Entomologists throughout the world

Shevtreev (I. J.). Регулированіе пола потомства самнами навздиммовъ. [The Regulation of the Sex of their Offspring by Female Ichneumonidae.] Bulletin du Laboratoire Biologique de St. Peterbourg, iii, no. 2, 1913, pp. 24-30.

The author records the observations made by him in the Entonological Laboratory of the Forestry Department on parasitic insects hatched from pupae: these had first been conducted on Pinephi instigator, F., but were repeated and confirmed also on Pimplaeraminator F., P. brassicariae, Poda, and P. capulifera, Kriech. Each Pimpla was kept in a special cage, made of cardboard and muslin and fed every alternate day, the food consisting of a smear of honey on a glass with a drop of water; some insects were fecundated, others were kept virgin during their whole life, which lasted from two to three months. The author has noticed that all these species of Pimpla belong to a group called by him "unimuptae," i.e. they are fecundated only once in their life, refusing afterwards to copulate with any other male. The opposite group, "multinuptae," for instance Theronia, consists of species, which are fecundated repeatedly and by many males. The fecundated, as well as the unfecundated females oviposited willingly on pupae which had been placed in an artificial cocoon, made from muslin or linen. Some of the pupae offered for oviposition were of large size, such as those of Sphinx, Saturnia, Gastropacha pini,

Smerinthus populi, etc., while other were small, such as Pieris, Bupulus, Panolis, Vanessa levana, etc. The author gives a few instances of his observations on fecundated females from which he concludes that. in depositing their eggs in various pupae, the females regulate, in the heat majority of cases, the sex of their descendants, according to the size of the pupae. In large pupae, containing a plentiful supply of food, are deposited eggs from which females hatch out, while small papae contain only male eggs. If only large pupae are offered, males can be quite excluded from the descendants of a given female, and when only small pupae were supplied the percentage of hatched males was greater than that of the females. These observations have been confirmed with pupae infested by parasites under natural conditions. The author had about 2000 cocoons of Lophyrus, the cocoons of the females of which are nearly twice as large as those of the males. He kept the cocoons of the males and of the females separately and obtained parasites from 970 cocoons; the parasites belonged to two species:-(1) Exenterus sp., of which 870 were bred; from the large coroons 21 per cent, were males and 79 per cent, females, and from the small cocoons 53 per cent, were males and 47 per cent, females; (2) Campoplex sp., of which 100 were obtained, 30 per cent males and 70 per cent, females out of the large cocoons, and 74 per cent, males and 26 per cent, females out of the small cocoons.

As to virgin females, his observations have confirmed previous statements that such females are able to lay eggs and to produce descendants, the latter being only males, and he is of opinion that this rule applies to the whole family of ICHNEIMONIDAE in its wide sense. The size of the males produced varied in accordance with the size of the pupae in which they developed. Giant males were obtained from the large pupae of Sphinc ligastri, dwarfs from the small pupae of Bupdus piniarius, and males of medium size from the pupae of Porus brussicae.

BORDAGE (E.). Notes Biologiques recueilles à l'Île de la Réunion. [Biological Notes from Réunion.]—Bull. Scient. de la France et de la Belgique, Paris, xlvii, no. 4, 5th Jan. 1914, pp. 377-412, 14 figs.

The author has given an account of some of the more interesting features in the life-history and habits of certain insects found on Réunion; many cases mentioned are of economic interest. In the Mascarene Islands sugar-cane is attacked by various Lepidoptera-Diatraea striatalis, Snell., Sesamia inferens, Walk. (albiciliata, Snell.), Grapholitha whistareana, Snell., etc.--which bore into the stem of the plants. Their principal enemies are three Ichneumonids: Ophion mauritii, O. untunkarus and Paniscus melanocotis, which also occur in Madagascar and Mauritius, where they are of great service to sugar-planters. Referring to the introduction of Sirex gigas into Réunion, the author draws attention to the great strength of the mandibles of this insect; he believes it to have been transported from Europe in wood into which thad eaten its way: Sirex gigas has been known to gnaw through a pile of cardboard, and even through the lead of cartridges. Further cases of parasitism on insects harmful to cultivated plants are recorded; in Réunion the coffee plants have their leaves mined by two microlepidopterous insects, Leucoptera (Cemiostoma) coffeella* and Gracilaria coffeifoliella, both of which are attacked by a Chalcid (Eulophus borbonicos, Gd.) and a Braconid (Apanteles bordagei, Gd.); L. coffeella is kept well in check by these parasites in Réunion, whereas in the Antilles serious damage is done by this moth. Three species of ACRIDIDAE are found in Réunion. Locusta migratoria, Acridium septemfusciatum and A. cabellam, and in certain years these insects have caused serious damage to sugar-canes. An attempt was made to combat A. septemfascutum, which was particularly prevalent in 1901, by introducing the fungus disease due to Macor exitiosus, Mass. In the laboratory the result was very satisfactory, as it was there possible to maintain the temperature and moisture conditions most favourable to the propagation of the fungus: but in the field the same success was not met with, possibly owing to the coldness and dryness of the season. In 1765 Poivre introduced the mynah of the Philippines (Accidotheres tristis, Vieill.) into Réumon: this bird which used to prev upon crickets and grasshoppers is now of little use in controlling these insects, as it has become practically frugivorous in habit,

The Coccid Orthezia insignis is plentiful in Réunion. At first it was recorded as feeding mainly upon the noxious plant Landau camura (Corbeille d'or), thereby being beneficial: but lately it has taken to feeding on cultivated plants and must be regarded as a post. An account of this insect in other parts of the world and its food-plants is given. Giard suggested that the waxy secretion deposited by this insect might be utilised in the making of wax candles, as it is used in China for the preparation of pe-la wax. Another Coccid post is Ceroplastes cinsoni which attacks the tea plant, mango trees, guavas, bibassier (Eriobotrya jupanica), Agamia papifolia, Quivisia heterophylla, and Aphlaia thereformis.

Two scale insects are harmful to the coffee plant, namely Saisstia cofficer and S. nigra, and also Pseudococcus admidum, which attacks not only the young shoots, but also the roots; this species is devoured by a Coccinellid, Seynous rotundatus, Motsch. Cocoa trees are attacked by the Coccid Aspudiotus destructor, Sign.; although no steps are taken to combat this insect, it remains well under control, probably owing to the fact that it is parasitised by certain Chalcids. Vanilla plantations are attacked by Certaphis totanine, Licht. A species of Psyllid (Triora libene, Gd.) has been found on plants of the laure family, and also on Orchids whose fruit it destroys; it is possible that at any time it may attack the vanilla; to avoid this possibility the author suggests cutting down the laurels that at present form its staple food.

CAESAR (L.). The San José and Oyster-Shell Scales.—Ontario Dept. Agric., Toronto, Ont., Bull. 219, Jan. 1914, 30 pp., 16 figs.

The original home of the San José scale is China. It was introduced into San José, California, about 1870. By 1893 or 1894 it had spread all over most of the United States and had even been brought into Ontario. It was doubtless brought in on nursery stock, and the insect can live and thrive at least wherever peach trees can be grown,

^{*} See this Review, Ser. A, i, p. 105, note.

and therefore may be expected to apread through all peach districts, but probably not further north than its present northern limit. All orchard trees, except sour cherries and usually Kieffer pears, are attacked. Currants, rose bushes, some ornamental and forest trees and shrubs are also severely affected. The insect may be easily dentified since it usually causes small, circular reddish spots on the fruit and a purplish discoloration of the tissues beneath the bark where it feeds. The adult female is almost circular, nearly flat, about verinch in diameter, grayish to ashy brown in colour, with usually a small vellowish area in the centre. The immature black stage is found at all seasons. The first brood of young scales begins to appear about 20th June and there are probably three, or nearly three, full broods a year in Ontario. A single over-wintering female may produce 1 (1881) (000) offspring. By far the most important of all the various means of distribution of the San José scale has been infested nursery stock. Once in a locality, it spreads from tree to tree by the active larvae crawling upon various kinds of insects or birds that alight upon or frequent infested trees. Winds and vehicles may also assist in their distribution. There is apparently little danger of establishing the pest in a new centre by marketing infested apples, but as a precaution the sale of such fruit is forbidden by law. The scale will attack any part of the tree or plant above ground and the bark may become thickly encrusted with it. The insects suck the juice of the plant and probably also secrete a poison which increases the injury. Small trees may be killed in a couple of years; larger trees usually take longer, and an old apple tree may survive for six years or more. lafested fruit is usually dwarfed. Among the natural enemies of this usset in Ontatio are Microweisea (Pentilia) misella, Chilocorus bivulvers. Aphelinus mytilas pidis and A. fuscipennis, a red mite and a fungus disease: but they are of little importance in controlling the pest. The insect can be readily controlled by a single thorough spraying one awear, before the buds have burst in spring; badly infested trees squire two applications the first year, one in autumn, the other in sing. The spraying must be done thoroughly so that every part of free above the ground is covered. The lime-sulphur wash is to-day recenised all over North America as much the salest, best and cheapest stray mixture. The most desirable strength is about 1 035 specific cavity. As a supplement to lime-sulphur spraying, kerosene or and petroleum emulsion may be used. Spraying should not be done seen the trees are wet, nor when it is likely to rain. Neither should the done when the temperature is below freezing point. The limealphur should always be tested with a hydrometer. It is usually essible to control the scale in one's own orchard independently of

The ovster-shell scale (Lepidosaphes ulmi, L.), believed to be an imported insect, attacks apples chiefly, and also pears, plums, theres, gooseberries, currants and ornamental plants. This scale reduces the tothe plant juices being sucked out by the insects. In thrifty or thanks the insect is seldom abundant, since it seems to exhibit a feference for neglected and weakened trees. Attacked trees usually have for many years. The female scale is about one-eighth of an arch long and scarcely one-third of this in width, this shape

distinguishing it from the San José scale. The ovster-shell scale passes the winter in the egg stage, the eggs hatching about 1st June. There is only one brood a year in Ontario, The chief means of distribution of this insect is the shipmen, of infested nursery stock, as well as the carrying of the larvae by binds and other animals. Among the natural enemies of this pest are lady bird bectles (adults and larvae), a few mites and a fungus discase. The lime-sulphur wash, properly applied, will readily control this scale. Two sprayings should be given for the best results, the first at the strength of 1030 and the second at 1039 specific gravity. The spray not only destroys the ovster-shell scale, but many other insects. Bordeaux mixture may be used in place of the lime-sulphur, just before the blossoms burst. Old trees should be pruned before spraying and the rough bark scraped off.

Gough (L. H.) & Storiev (G.). Methods for the Destruction of the Pink Boll Worm in Cotton Seed.—Ministry Agric., Egypt, Caro, 1914, 21 pp.

The history of the pink boll worm in Egypt has been a short, but disastrous one. The moth (Gelechia gossypiella, Saund.) was intro duced from abroad not many years ago. The first specimens recorded by the Entomological Section were bred on 29th November 1911, and in 1913 Gelectia larvae caused more damage than all the other cotton pests put together. In 1912 experiments to destroy the caterpillarby fumigation were all carried out on seeds in sacks, but the method was recognised as very imperfect. In 1913 other experiments were made and the methods may be classed into mechanical and chemical The mechanical methods included hot water treatment, cold air treatment, hot air treatment, and enclosure in a vacuum. In the expenments on the first method, small equal quantities of seeds were tied up in muslin bags and immersed in beakers of hot water for one minute the temperature being recorded by a thermometer in the water and another with its bulb within the seeds. From experiments it is shown that the fatal temperature for Gelechia larvae must be very close to 50° C., while the fatal temperature for cotton seed is very near 75°. This is not a suitable method for employment on a large scale on account of the necessity for the immediate sowing or immediate drying of the tested seed. An experiment was made with tempera tures under 0°, and -6° C, was found to have no effect on the larvar Experiments on the effect of temperatures over 60° C, gave positive results. In the first series a hot water bath was constructed and traversed from end to end by a square tunnel which sloped gently upwards. Two rollers outside the ends of the tunnel carried an endless band of cloth, on which the seeds to be tested were placed and the carried through the tunnel. It was found that exposure to a temporal ture between 75° and 94° killed all the larvae without affecting getain nation. The results might possibly have been different if the seed had been resting on metal instead of cloth, and caution is urged if the method of hot air treatment is used. In a second series of experments, the seed was lying on a sheet of asbestos, and here four mind's at 80° appear to have been perfectly effective in killing the caterpillarwithout unduly affecting the seed. Any hot-air machine must trd. To test the possibility of killing Gelechia larvae by subjective them to reduced pressure some of the insects were introduced into the xacuum at the top of a mercury barometer, but half an hour under these conditions had no effect.

the chemical methods tried were chiefly based on the poisonous effects of various gases. Carbon bisulphide vaporised at the rate of Lee, of the fluid to each litre of the seed gave perfect results at the end of half an hour. Three methods were used, the fluid carbon bisulphide being sprayed on the cotton seed whilst passing into the container; the carbon bisulphide introduced into the container before filling with and the carbon bisulphide vapour circulated through an evaporating chamber into the container through an air-pump and back through the evaporating chamber to the container. The last method is the best, but the last two both gave perfect results. A machine to atilise the last method could be constructed on the following general lines. -Five or six vats to contain the seeds to be treated form the battery." These vats must be constructed so that they can be bermetically closed when charged. Arrangements must be made to pump the gases in below, and a diffuser would be required at the top to draw off the gases. The circulating system would consist of an exhaust main and a blast main connected by a rotary or turbine airpump. From these mains, branches would be given off to each of the vats. This would enable a constant current of air or gas to be run through any or all of the vats, since each branch would be arranged so that it could be cut off from the main by a tap. In practice one vat would be filling with seed, the following filling with gas, the next two would be standing to let the gas act, the fifth would be discharging gas and the sixth discharging seed. By this method the charges of carbon bisulphide required when the machine is going will be considerably reduced, and the advantage of having two vats "standing" full d gas is that the period of action for the gas is thereby doubled. Litholi bisulphide vapour has no effect on the germination of cotton and. As the time proposed for action of the gas is not more than one tour, no fear need be entertained of deterioration of the seed. Motor son was tried and although used in larger quantities was less effec-→ than carbon bisulphide. Ammonia was unsatisfactory, especially s germination appeared to suffer. Hydrocyanic acid gas, even in way small doses, kills a very high percentage of larvae, but requires a over time to act than carbon bisulphide. The expense for chemicals ever, would be less. The use of sulphur dioxide produced by a Cayton machine "gave distinctly promising results, but they sot be compared with the results of other experiments, owing to "compossibility of using the machine for small scale trials. Tobacco and vaporised Cyllin were ineffective, although Cyllin in solu-1 - 8 of 1: 1,000 were all that could be desired, if the seed containing be lavae were soaked for a period of twenty-four hours. "Salva-The in dilution of 1: 1,000 was effective in killing the caterpillars, diffected germination also. It has been found that no treatment when the seed is in sacks, and in order that such treatments are mentioned above may be effective, rigorous measures should be depted to destroy all cotton bolls left on the cotton sticks after the " backing.

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Vassiliev (I. V.). Шелкопряды сосновый и кедровый, мхъ образь мизни, вредная дѣятельность и способы борьбы съ ними. [Dendrolimus pini, L., and Dendrolimus segregatus, But].. their life-history, injurious activities and methods of fighting them.] Труды Бюро по Энтомологіи Ученаго Номитета Главнаго Управленія З. м З. [Memoirs of the Bureau of Entomology of the Scientific Committee of the Central Board of Land Administration and Agriculture.] St. Petersburg, v. no. 7, 1913, 99 pp., 34 tigs. 2 col. plates. (Second, enlarged edition).

This is an enlarged edition of the author's report on Dendrolums pini and D. segregatus, after investigating in 1898 and 1899 the devastation caused by the latter in the forests of the government of Irkutsk (Siberia). After describing fully all the stages of these two moths the author proceeds to deal with the life-history of D. pini. Hot dry weather accelerates the development of the earlier stages and the appearance of the imago, while a cold, wet summer has an opposite effect In most parts of Russia the moths start flying from the end of June to the beginning of July, and attain their reaximum during the middle of July. A full account is given of the oviposition, development hibernation, pupation, etc., of both D. pini and D. segregatus. The flying of the latter species in the forests of the southern part of the government of Irkutsk took place in 1899 at the end of June and the beginning of July, and after the 27th July no live moths were to be found, the earth everywhere in the forests being covered by their dead bodies. These insects were specially abundant in woods consisting of Pinus cembra and in the "taiga," while they were totally absent in pure birch-woods and in mixed woods of pine, larch and birch trees. in pure pine woods they were found only where the latter joined the affected areas. In 1898 there were very few moths in the forests of the government and the author did not find any of their eggs, but there were plenty of caterpillars; this fact led him to assume that the development of the insect takes two years, that the year 1898 was not a "flying" year, and that the year 1899 would witness an outbreak of the moths and extensive oviposition. The assumption proved quite correct and early in July 1899 there was scarcely a small plant which did not bear eggs of D. segregatas. The trees most affected were Pinus cembra, the silver fir (Abies pectagon) and the spruce (*Picca excelsa*); less frequently the eggs were found σ . needles of pines and larches, while in exceptional cases only were the found on leaves of birch, aspen, service trees, spiraea, red and black bilberry and various grasses. It was observed that the insects did by oviposit on plants affording a limited supply of food; eggs were schlow found on freshly stripped or withered plants, in which respect this species differs from D. pini, the females of which oviposit indiscriminately on plants in any state. Most of the eggs were laid on the needles and only in a few exceptional cases were they found on the branches of trunks. The total number of eggs deposited by one female is on the average about 200, the maximum number being 315. The hatchest of the caterpillars proceeded from the middle of July till the middle

^{* [**} Taiga* is a Siberian word signifying a dense, more or less imparatral forest, often of a swampy character. - ED.]

August, and most of them hibernated before the second moult, as the temperature of the nights and early mornings fell sometimes to ficezing point even in the first half of August. The caterpillars appeared again on the trees in the first half of the next May, but just after their appearance they take little food. The feeding increases gradually, and the maximum damage to the trees takes place in June and July, when a caterpillar may devour in a few minutes a whole nin needle: during this time the caterpillars more than double their size. In August the feeding decreases again, although the caterpillars still remain on the trees, passing to the second wintering in September. Hibernation takes place in both cases under moss in the "taiga." After the second winter the larvae appear again in April, feeding till early in June, when they pupate, producing moths in the same mouth.

The author goes on to deal with the importance of D. pini in the economy of forests, describing the nature and consequences of the damage done, the selection of plantations by the females for oviposition, the methods of migration of the caterpillars, and the geographical distribution of the pests. It often happens that numbers of the larvae perish through not being able to find food in the woods laid bare by the preceding generations; moreover, the denudation of the crowns of the trees also caused the pupae to perish, owing to the excessive heat of the sun's rays, coupled with the loss of moisture. The bare crowns favour also the activities of various parasites, and the number of caterpillars infested by them in such trees is much larger than in trees with needles on them. While D. pini prefers pine trees, which provide its principal food, D. segregatus avoids these trees, and the author states that he has even seen single pines or groups of pines unattacked or only slightly damaged, while all the trees round them (firs, cedars, larches) were entirely stripped by the larvae. In the government of lrkutsk the principal food of these insects is provided by firs, Siberian his and cedars, while in some parts of the government of Ufa D. segregatus damages principally larch trees. The caterpillars attack mostly old cedar woods or "taiga" forests (100-150 years old) which form the greater part of the forests of Irkutsk; young plantations, up to 10 years are seldom attacked, unless they are situated in the neighbourhood of an infected area; otherwise they are only attacked after the older trees are laid bare. While it is admitted that the young larvae of D. segregatus may possibly be distributed by the wind, the older caterpillars are able to migrate only for short distances. The geographical distribution of D. segregatus includes the whole of North Asia. from the Ural Mountains to Japan, the north-western limit of its distribution being Syrostan, in the Southern Ural. The author gives a short history of the devastation caused by this pest since 1892, when attention was first drawn to the enormous damage caused by it in the "taiga" of Eastern Siberia; the local population had known the larvae for 15-20 years previously. Most of the attack was concentrated in two districts of the government of Irkutsk and it is calculated that the damage there amounted to more than £55,000, several hundred thousand dessiatines (2.7 acres) of forests being destroyed or In these districts may be seen enormous areas of dead and dying forests of cedars, firs and larches. Young trees, of up to 20-30 years, die in the same year: the older cedars and firs, when damaged by D. segregatus, are usually subjected afterwards to attacks

of such beetles as Monochanas sactor, M. pistor, M. sacra arius, Ips typographus (fits) and I. sexdentatus (cedars). To must be added the injury caused by the decrease in the fit and cut trades of the locality, which resulted from the drying out of the "taigh." In 1902-3 an outbreak of D. segregatus occurred on the European side of the Southern Ural, in the district of Zhatoust of the government of Ufa and in the adjoining district of Troitzk of the government of Orenburg, where some hundred dessiatines of deciduous trees were devastated.

With regard to the natural enemies of D. pini, the author says that amongst manimals the most important are bats. Among bads, various titmice and tree-creepers eat the eggs: the caterpillars atprincipally devoured by enckoos, as well as by crows, rooks, magnes, jackdaws, great spotted woodpeckers and rollers. The large cater pillars and moths are also destroyed by the grey-backed shrike (Lapore excellitor), which impales them on the needles of young pines. The pupae of D. pini are eaten by Paras ater and P. cristatus, also by cross jackdaws and rollers. The moths are principally attacked by oxly goatsuckers and the red-footed kestrel (Ergthropus vespertinus). Egthe most important enemies are insects, amongst which the following predators are mentioned; predaceous beetles and their larva-tchiefly Carandoxe), ants, Pentatomid bugs and Asild flies. Tocaterpillars and pupae of D, pini are subject also to fungus diseases. and especially those caterpillars which winter in wet soil; chief amongthe fungi the author puts Cordiceps militaris, but there are also cases reported of diseases caused by Emposa and Botrgtis. The bacterial diseases have not been fully studied, but the author is of opinion that flacherie probably exists.

Considerable space is devoted to parasites of D. pini, and a list is given containing 13 species of Diptera, Tachina winnertzi, B.B., beng recorded for the first time; there is also a list of parasites of the fam: lies ICHNEUMONIDAE, BRACONIDAE, CHALCIDIDAE and PROCTOTES PIDAE (p. 55). The author remarks that this list cannot be considered to be final, and it is probable that some of the parasites may prove to be hyperparasites, as has already been proved by him in the case of Theronia flavicans and Monodontomerus virens, while others, such as Ischnocerus marchicus and Rhogas escubeckii, may have to be excluded The egg parasites Oveneyetus atomon and Telenomus umbripennis were first found by him in 1904. The author deals separately with each parasite, and gives in every case a list of their other hosts. He mentions that the Tachinid fly, Phryxe (Blepharidea) vulgaris, Fall, is ovi-vivigerous, a female laying up to 5,000 larvae, each included in a transparent cover, which sticks to the skin of the caterpillar; Sarcophaga allowys Mg., and S. affinis, Fall., are both viviparous and monophagous. With regard to Trichogramma (Oophthora) semblidis, Aur., the author is satisfied, by his latest experiments in 1912-13, that this species is not synonymous with T. carpocapsae, Ashm., and he points out the difference in the habitat of the two species, remarking also that T. carpocapsac does not infest the eggs of D. pini, breeding in nature principally in the eggs of Cydia pomonella, and also in those of Phly aenodes sticticalis and Euproctis chrysorchoea. His experiments and observations have satisfied him that Telenomus phalaenarum. Nels. never infests the eggs of D. pini.

With regard to the enemies of Deudrolimus segregatus in the governand of Irkutsk, they consist principally of certain birds and parasitic The large caterpillars are devoured by a jay (Garrabas in-. . . . while the smaller caterpillars and the eggs are destroyed by and Poccile baicalensis and similar species; both these loris, in company with woodpeckers and the nut-cracker (Nucifraga adactes), destroy also the pupae. The most active parasites, according to his observations in 1899, were: Pauzeria radis, Fall., and Masicra cespitum, Macq., which destroyed in the Shadarinsk " aga " more than 30 per cent, of the caterpillars: while the eggastastic. Telenomus gracilis, Mayr, also proved very useful, more than with the eggs collected by the author being infested; in the young the godders he found parasites of the genus Rhoges. Besides parasites and bands, the insects perished also in great numbers from a bacterial which the author is inclined to recognise as flacherie. As consisting or remedies the author suggests mixed plantations, consisting if quiduous and coniferous trees, oak, birch, beech and aspen being reand granted as suitable. Small woods, of trees of various ages, even when , sasting only of pines, are also less damaged by the insects and can better supervised; care must also be taken to cultivate strong salthy trees, which will be able to withstand the damage. With regard to destructive remedies he recommends buit-belts of tanglefoot; solation avenues, to divide the attacked parts of the wood from the test; poisoning of the caterpillars by means of Schweinfurt green, in a proportion of about 2 lb, of green and 4 lb, of freshly slacked lime in about 110 gallons of water. The handpicking of wintering caterthat has proved to have very little effect. The destruction of the 125 of D. pini can be recommended only as a secondary remedy, and * is only admissible when there are no signs of the eggs being infested or parasites. The eggs can best be destroyed by crushing or smearing them over with naphtha or by handpicking and this must be done sackly at the time when the flying of the moths is nearing its end. The collection by hand of the moths, which usually sit motionless corning the day, not very high above the earth, is also recommended, especially before oviposition has started; the collection of the pupae sonly recommended when the percentage of pupae infected by parasites is small.

With regard to Dendrolimus segregatus, such remedies as hait-belts do not appear practicable in the forests of Siberia. But the fighting of the pest by means of its parasites may prove very successful, principally the parasites of the eggs, such as Telenomus gracilis and T. meloripomis. These must be artificially bred and supplied to localities threatened by D. segregatus.

 Dentz (G.). La Fourmi-Manioc (Oecodoma cophedotes). -L'Agronomie Coloniate, Paris, i. no. 5., Nov. 1913, pp. 129-135; i. no. 6, 31st Dec. 1913, pp. 164-174; i. no. 7, 31st Jan. 1914, pp. 13-18; i. no. 8, 28th Feb. 1914, pp. 42-51, 1 pl.

Opening with a few paragraphs on the general agricultural conditions a French Guiana, the author draws attention to the fact that many freight have given up agricultural work, and this he believes to be the to the many discouragements met with in agriculture; for example,

in one night the most beautiful field, garden or fruit trees may be devastated by a band of leaf-cutting ants, known in the colony under the name of "fourmi-manioc," the greatest enemy to agriculture in Guiana. When on an expedition the ants form two groups: one group climbs the tree and bites off the whole leaf or parts of it, while the other group waits at the foot of the tree and gathers the leaves, which they carry to the nest. Numerous remedies have been tried against these insects without much success, such as the introduction into their nests of boiling oil, chloroform, corrosive sublimate, etc., and the Clayton system of forcing sulphurous fumes into the nest has not proved effective. Carbon bisulphide however has given excellent results, but apart from its dangerous qualities, it has the drawback of being expensive, as large quantities have to be used.

As a result of his experiments the author was led to believe that sulphurous anhydride would be still more useful. This substance when liquified possesses a considerable force of expansion, which together with its great density, ought to allow it to penetrate to the deepest galleries. It is also very soluble in water and diffusible, and is not poisonous in small quantities, since the State authorises its use in wine-making to the extent of 350 milligrams per litre. The air cannot be breathed when it contains 1.5 per cent. of this gas. Pure liquefied sulphurous anhydride is prepared by two companies in Paris-La Compagnie Raoul Pictet, and Le Laboratoire des Industries Alimentaires. In Guiana this substance may be obtained for 0.85 francs (about 8d.) per kilo. (2.2 lb.), and is sent in copper or steel drums containing 25, 50 or 100 kilos. These drums are stamped at 30 atmospheres and have a tap. This tap is prolonged to the interior so as to receive a bent tube forming a siphon, so arranged that according to the position in which the drum is placed the anhydride can be obtained either as a gas or a liquid. Having obtained one of these drums, it is placed near the nest about to be destroyed, and a tube 3 metres long and 1 centimetre in diameter is attached to it, by means of a union. This tube is flexible, being made of bronze and asbestos. and surrounded by a metal twist of bronze to make it stronger. It ends in a stiff copper spike about 75 centimetres long, pierced in the last ten centimetres with about a dozen holes to allow the gas to escape. The outside of the nest is cleared to expose all the openings and it is generally necessary to remove the superficial layer of earth. The spike is then inserted into a hole only when it can be easily thrust in to a depth of 20 to 25 centimetres in any one direction, all the openings being thus treated. The spike should each time be slipped into a hole before opening the tap, the whole process taking about two hours The necessary time for each hole varies, according to its importance in the nest, from two to five minutes. After the use of sulphurous anhydride it is not at all necessary to dig out the nest, but it should be visited a few days later to see whether any ants are still alive. This method has been employed with perfect success in the destruction of many large nests, and the treatment of a nest 15 metres in circumference and the top about 40 centimetres above the level of the seil. was witnessed by a meeting of the Chamber of Agriculture. The next day this nest was dug out and found to consist of seven tiers of nests, the lowest being at a depth of 1.5 metres; all the ants were dead and discoloured. 4 kilos of sulphurous anhydride being used.

This substance has many advantages over carbon bisulphide, since it is not inflammable, can be used at all times of the year, water not being at all necessary, and has no ill effects on neighbouring plants. When done thoroughly, as described, the results are said to be perfect.

Headles (T. J.) & Parker (J. B.). The Hessian Fly. Kansas State Agric. Expt. Stn., Manhattan, Bull. 188, July 1913, pp. 87-138, 15 figs. [Reed. 28th March 1914.]

The Hessian Fly first appeared in Long Island in 1779 and has spread north, south and west, causing serious loss in most of the wheatgrowing regions of the United States. Since its first appearance in Kansas the fly has alternately disappeared and reappeared, since unfavourable weather conditions or an undue abundance of natural enemies may almost eradicate it. The egg is deposited upon the upper surface of the leaf, generally on wheat, rye, and barley, though recent evidence shows that certain wild grasses, as Agropgron smithii, serve as well. The length of the egg stage varies from two to ten or more days. An individual bred in an insectary, in an average temperature of 67 F, and an average mean relative humidity of 67.2 per cent. required 60 days to pass through all its transformations, of which 26 days were occupied in the period from hatching to the formation of puparium. The length of the life of the adult fly, a tiny long-legged gnat, is usually limited to a few days. The number of broods in Kansas varies with the climatic conditions. In 1908, the summer of which was very wet, there appear to have been two main broods and three supplemental broods. The main spring brood emerged during March and April; a supplementary spring brood emerged between 7th May and 1st June; a midsummer brood emerged between harvest and wheat sowing on the volunteer wheat; and the main autumn brood of adult flies emerged between 22nd September and 28th October. None of these produced progeny which reached the adult stage before winter. From the 15th to 30th October, a supplemental autumn brood emerged. Normally the midsummer brood might be almost entirely suppressed and no supplemental autumn brood developed. Temperature and moisture probably exert the largest influence on the Hessian fly. The low temperature of winter prolongs the lifecycle of the fly from 30 to 60 days to 6 months. Gossard and Houser showed that eggs after being subjected to a very severe frost in the field are not injured. In a moist atmosphere eggs withstood 107.6°F. easily for three days. Drought is dangerous to the fly and plenty of atmospheric moisture is favourable to it.

Osborn records for America six species of insects parasitic on the Hessian fly, namely, Merisus destructor, Say, Homoporus subapterus, Riley. Pteromalus pallipes, Forbes, Eupelmus allyni, French, Entodon epigonus, Walk., Polygnotus hiemalis, Forbes, and Platygaster herricki, Packard. Tetrastichus productus, Riley, and T. carinatus, Forbes, are parasites attacking the primary parasites of the fly. A new species of Sciara and a wire-worm were found to be predaceous enemies of the Hessian fly.

The autumn broods of maggots attack the wheat plants when they are young and the infested stalks are always stunted and frequently killed, though "tillers" may grow out from below the point of injury.

The spring broods of maggots attack the plants when much larger and better able to withstand injury. The attack of the fly macron weaken the stem that it will break at the point of injury and fall over before harvest.

Among measures of control often advocated is the pasturing of wheat, but this has been proved totally insufficient to control the # Rolling or brushing is also of little value and moving does not and promising in Kansas. No strain of wheat is yet known to be "all proof." Garman's work in Kentucky shows that regular treatment of infested wheat with kerosene emulsion, Bordeaux mixture, fine and Paris green, and lime are of little value, while intermittent wheat culture and trap planting seem as useless. Destruction of fly or infested stubble is no doubt one of the best means of combating the pest, and may be accomplished by burning and ploughing motor Burning the stubble will destroy many of the puparia, but will hot kill enough to keep the insect under control, those underground remaining untouched. The reason for ploughing lies in the idea that the infested stubble can be so deeply turned under and the ground so firmly packed that the flies emerging from the buried puparia wal perish before reaching the surface of the soil. As a result of expenments it seems that where the ploughed stubble is buried beneath logor more inches of well pulverised soil, none of the flies can escate Volunteer wheat is a menace to the succeeding crop and should not be allowed to grow. Late sowing is one of the most, if not the most, efficient of all measures for fly control. In different territories the date for safe sowing varies and should be ascertained by the entonion logist, who should adopt as the safe sowing date the average of dates on which the sowings of several years have been found absolutely free from fly. When an outbreak is anticipated a close watch should be kept on the fly emergence. The following steps are recommended when wheat is to be sown on a field infested the previous year. The disk should follow the reaper as quickly as possible, since it causes many of the weed seeds and most of the volunteer wheat to germinate and renders their destruction more certain and tends to bring about early emergence of the fly. The disked ground should be turned with a plough three or four weeks later and all rubbish buried at least four inches below the surface of the soil. If there is too much stubble to allow this the field should be burned over before being ploughed. By the use of harrows and packers the surface layer should be pulverised and packed down into a good seed-bed. The crop should not be sown until the safe-sowing date. Good seed and fertile soil will produce thrifty, rapidly growing plants, which will suffer much less injury from fly.

HEADLEE (T. J.) & McColloch (J. W.), The Chinch Bug (Blisses leucoptera, Say). Kansos Agric, Expt. Stn., Manhattan, Bull. 191, Nov. 1913, pp.,287-353, 7 pls., 11 figs. [Reed. 28th March 1914.]

The chinch bug has damaged Kansas crops to a greater extent than has any other injurious insect, and its history reaches back to before the settlers landed. Where corn and similar grains alone are grown the bug does small damage, because food is scarce in the early summer; and again, if wheat and other small grains alone are grown the harm

ail, for food is scarce in the latter part of the summer. This winters in bunch grass (Andropogon scopariots, Michx.), big blue 4. furcatus, Muhl.), false redtop (Triplasis purpure i, Walt.) and a bunch-forming grasses. With the advent of warm weather auch bugs begin to emerge and leave their winter quarters for And other small grains. Here the young are produced and was maturity shortly after harvest time. With the failure of food in all grain field the bugs migrate into adjacent fields of corn and Jeroma. Here the young produced reach maturity in the autumn and the matural checks are the state of the matural checks thinch bug, climate is probably the most important, temperature A moisture having been shown to exercise a great influence on the The low temperatures of winter diminish the metabolism and when the life of the bug. Specimens have been frozen in ice and of provered when released. Subjected to a constant temperature F, with a humid atmosphere the chinch bugs perish too quickly and the translation. They thrive in dry seasons, but die in wet ones, not get cent, relative humidity being considered from experiments to Section favourable at a temperature of 70 F. Wet weather destroys be long directly and indirectly; directly by burying the young and the east indirectly by weakening the bug and rendering it more susceptible a descase and by encouraging the growth of its fungous parasite, Special inches and interpretation of the special states of the special states of the special special states of the special spe English aphidis, Hoffman, stand pre-eminent among the enemies of the chinch bug. Much work has been done on these fungi, but all the really careful experiments agree with the author's results showing that it is not possible by artificial distribution of the lungus Lasten materially the progress of the disease. On the whole these catastic fungi are well distributed throughout that part of the United states subject to chinch bug outbreaks and cause great epidemics when State lature and moisture become favourable. An average temperatime of 75. F. and a moisture close to saturation are most favourable to the activity of S. globaliferum. Among animals the chinch bug tas few natural enemies. No internal parasite is known to attack it. Es lady-birds, Megilla maculata, de G., Coccinella sanquinea, L., Hoppodamia convergens, Guér., H. glacialis, F., H. 13-panetata, L., will two species of Seymmus, and Chrysopa plorabanda, Fitch, have been receided as its foes. The flower bug (Triphleps insidiosas, Sav) and Mosts cinetus, F., have been known to destroy the pest. Twice the take chinch bug (Nysius angustatus, Uhl.) has been observed feeding in the nymphs in the field; and Harpalus compar, Lec., Enorthrus whiles, Lee., and Anisodactylus harpaloides, Laf., have been seen beding on bugs of all ages. A centipede and Gryllus sp. feed on adults; To ant. Solenopsis molesta, Say, was observed carrying off chinch bug 1225, and Monomorium minimum carrying bugs of all sizes. Among hids the chief enemies are the quail, prairie chicken, red-winged blackand, cathird, brown thrush, meadow-lark, house wren, tree swallow, formed lark and flicker. These are not efficient enemies. In a single Far the chinch bug damages crops worth millions of dollars and may reatly reduce the wheat and absolutely destroy the corn and sorghums of the individual farmer. As the result of many tests it has been found that twice during the year the chinch bug may be destroyed while passing from wheat and other small grains into adjacent fields of corn and sorghum, and when just firmly established in winter quarter, As soon as the harvest is over the stubble should be moved and burner off so as to leave no food for the insects, and the weeds and grass design troved by thorough disking. This would compel them to leave the field in search of food, and in this passage they are caught by barnets Two types of barriers are efficient -- the dusty furrow for dry weather and the coal-tar or oil line for wet weather. The dusty furrow is a shallow ditch between the infested and non-infested fields, made wita plough, lister or trough drag, the sides and bottom of which have been reduced to a fine deep dust. The insects that collect in the furrow are then killed by flaming the sides and bottom of the barries with a strong gasoline torch, the most efficient torch used being the "Locust Torch." The tar or oil-line barrier is a slender line of tar of oil poured along a smooth surface between the infested and hot, infested fields. Prof. S. A. Forbes has found the Standard Oil Con. pany's No. 8 road oil efficient and road oil No. 7 has been found to be a highly satisfactory substitute for the tar. To destroy the bugs the may get across, the infested plants are sprayed with kerosene emulsion or, better still, with a solution of whale-oil soap or a decoction of "Black Leaf 40." The destruction of chinch bugs in winter quarters by the use of fire has proven, in the author's experience, the cheapest and most practicable method of solving the problem. Fire destroythe bugs directly or leaves them exposed to the weather by destroying their cover. The fire must be handled so as to make it burn close to the crown from which the stubble grows and the type of firing varies with the weather. November and December burnings have give the best results.

Ceratitis hispanica in Alglers. Bull, Off. Gow. Gén. de l'Algèrie, Pars. xx, no. 1, 1st Jan. 1914, p. 3.

It is stated that in the department of Oran orange trees were much damaged during 1913 by the attacks of *Ceratitis hispanica*, which caused the fruit to drop or to die on the trees. Proprietors were recommended to place bottle-traps on the trees, a practice which was successful against the insect in other parts, and which is unattended by risks of destroying the fruit or rendering it harmful to man evanimals.

Contre les punaises de la Vigne. [Combating the vine bug.] La V. Aarie, et Rurale, Paris, iii, no. 6, 10th Jan. 1914, p. 167.

To combut the vine bug (Nysius senecionis) it is recommended by M. Picard of Montpellier to plant at intervals between the rows a species of false rocket (Diplotaxis crucoides), which attracts the insectables plants are to be watered with boiling water or a corrosive liquid that will kill the insects.

Vignobles et Vins. [Vineyards and Wines.] -Rev. Vitic., Puris. xii. 29th Jan. 1914, pp. 131-139.

This commercial review of vine-growing in France during 1913 contains the following notes. In the Department of Aude the caterpillars of Arctia caja appeared in large numbers, but were destroyed by

a pathogenic fungus, Empusa audicea, before doing much harm, Numerous pupae of Polychrosis and Clysia had been found in the winter. The first invasion was not severe, but as many growers had neglected lead arsenate treatment, the second generation of these Microlepidoptera was much larger in July. Polychrosis became very abundant and its third generation caused important injury. It is imperative that spraying with lead arsenate be practised against the first generation. Cenophthira in large numbers has caused much damage to the vanetards in the districts of Carcassonais, Minervois, and Etang de Marcellette, and the treatment applied formerly must be reverted to, and especially the use of arsenical insecticides. The winter slack again is being taken advantage of in some vineyards in Tunis for applying measures against the white scale, Pseudoroccus vitis.

Sur l'alimentation de la mésange bleue. [On the food of the blue tit.] Bull. Soc. d'Étude et de Vulgarisation Zool. Agric., Bordeaux, xiii. no. 1, Jan. 1914, p. 16.

Some interesting observations were made by M. Richard near Neuchitel on the feeding habits of blue tits. During October, when the leaves of the reeds had died down and only the long yellow stems with the heads remained standing, a blue tit was observed to fly down upon the reeds and break off the heads with its beak, in order to extract meet larvae, which it would devour. It is suggested that the tits which attack almonds are really in search of the larvae they contain and not eating the almonds themselves.

ENGEBEUND (). A propos des nichoirs artificiels. [Artificial nesting boxes.] Bull. Soc. d'Etude et de Valgarisation Zool. Agric., Bordeaux, xiii, no. 1, Jan. 1914, pp. 16-17.

The author records some interesting facts in connection with the destruction of insect pests by birds, housed in artificial nesting boxes. The birds, which were tits, cleared an apple tree in his garden of woully aphis; red currant bushes were cleared of sawfly larvae, and batchen garden plants of Pierids. Vines attacked by Haltien, were also visited and the pest practically disappeared.

FEYENCO (J.). L'Otiorhynque sillonné (Otiorrhynchus salcatas) dans Vile d'Oléron. [Otiorrhynchus salcatas in the island of Oleron.] Bull. Soc. d'Etade et de Valg. Zool. Agric. Bordeaux. xiii, no. 1, Jan. 1914, pp. 7-14, 2 figs., 1 map.

The island of Oléron is, excepting Corsica, the largest of the French saids. The soil and climate are well adapted to vegetation and a size part of the island is under cultivation, vines being especially bundant. Insect pests have not in the past attracted much attention, as their ravages have not been serious, but at the present time alarm is being felt at the spread of certain species, notably of the weevil, transported in the island was to have been observed for the first time about four years ago, between Biroire and Chef-Maillère; since then it has spread outwards it all directions. The adult damages the vines by attacking the shoots and arresting their development; this is the most important injury

done, but, in addition, the larva attacks the roots. Other points attacked are the peach, raspherry and strawberry. The insect appears at the end of May; the eggs are laid during the summer on the earth; the larva, which is fully developed in the autumn, hibernates until the following spring. The adult cannot fly, and consequently present in Oléron the attack is restricted to about 100 acres in the commune of S. Pierre.

Description (E.). La lutte contre les Cochenilles des Orangers. [Orange Scale control.] Rev. Agric. Vitic. Afr. Nord. Algiers. iii, no 98, 24th Jan. 1914, pp. 83-85, 1 fig.

Agriculturists in the Philippeville district, in Algeria, decided to undertake general measures for control of the orange scale, Chryson phalos minor. Three insecticides were tested: Polysulphides of calcium, petroleum-soap, and Cooper's Fluid. During the summer the Syndicat Agricole has sold at 75 centimes per kilog. (about 31d. per lb., a petroleum-soap prepared in the following manner: A metal pois placed in a pan containing water kept at boiling point and acting as a water bath: in the pot 4 lb. of soft soap and 6 lb. of ordinary petroleum are mixed until the soap no longer sticks to the woode, spatula used; the pot is then removed and its contents are quickly stirred for a few minutes until a soft paste is formed which stiffens on cooling. Of this paste 10 lb, is dissolved in 20 gals, of water, and as an average of 2 gals, is required per tree, the cost is about 34d., or 44d. including labour. In using Cooper's Fluid 1 quart is diluted to 25 gals with water, the cost per tree being practically the same as for petrolemasoap. When inspecting the orange groves in the valleys of Zéramusa and Saf-Saf in September 1913, a visit was paid at Oued Louach to the plantation most heavily infested by Chrysomphalus minor, Parki toria zizyphus. Coccus hesperidum and Pseudococcus vitri. The leaves were completely covered and the fruits nearly so. Trees treated with different insecticides were found in a satisfactory condition generally. The insects were dead on the leaves: but on the fruit, though less numerous, they were nearly all alive. The young shoots were w. affected. Petroleum soap mixture emulsifies with difficulty and the has caused injury to the plants and fruits: Lorette powder was unsatisfactory: Cooper's Fluid gave good results. At Oned Kapa repeated spraying has checked the increase of the scales: some burnhad been caused by the petroleum soap mixture and the polysulphides of calcium proved of doubtful value. M. François, head of the School of Agriculture, made use of polysulphides specially prepared under his supervision, and these were efficacious. On a large estate at St. Charles three applications of Cooper's Fluid resulted in very few scales being found. At Boufarik the polysulphides were a source of complaint, as having caused burns. The author thinks it chimerical to try to stamp out the orange scale at present in view of its universal occurrence, but it has now been shown that its ravages may be reduced to a minimum. Cultivators must consider it in the same light as vine-growers regard mildew, oidium and black-rot. The three inserticides recommended as a result of the 1913 tests are: -(1) the polysulphides of calcium, a safe product being obtained with 3 parts by weight quicklime, 3 parts sublimed sulphur and 200 parts water:

expertoleum-soap, if well emulsified: (3) Cooper's Fluid, at a strength of 1 to 13 parts in 100 parts of water. Treatment must be effected at the following times: One application after fruit-picking, when the yoar g scales are not yet protected by the fourth envelope of their \$\frac{1}{2}\cdot \frac{1}{2}\cdot \frac{1}{2}\cdot

CONTE (). Les parasites du blé. [Parasites of wheat.] Rev. Agric. Vitw. Afr. Nord. Algiers; iii, no. 96, 97; 10th/17th/Jan. 1911; pp. 31-33, 54-60; 14 figs.

Hylenegia coarctata, the wheat fly, which closely resembles Musea domestica, has injured wheat in Tunisia, where the author observed · in 1911 near Béja, Tunis, and Kairouan. Two generations occur consully. The larvae of the first gnaw the inside of the stem, causing the plant to turn yellow, but rarely killing it. They are always found at a depth of I to 3 centimetres underground. Pupation takes place a the stem during January and the imagines appear from February to March. The larvae of the second generation burrow in the seconcary stems due to tillering; on reaching full development they leave the plant and pupate in the soil. The larvae are never found in the cancipal stems, which remain vigorous. Thus the past season, which was exceptionally dry, has largely favoured their increase, ad tillering being also checked by the lack of moisture, the damage one was noticeable, whereas this is not the case in a moist season, the author has never observed this pest except on various kinds of sheat, though it has been stated that it injures barley and rye. The esty advisable means of combat are to obtain by proper cultural sethods, the use of manures, and the selection of vigorous seed suited to the soil, such robust plants as are able to withstand the injury and coduce remunerative crops. The attack of the first generation is the most dangerous, and may be avoided to a certain degree by late

Stotropa cereadella, is prevalent in French North Africa. The eths appear in May, and soon afterwards the females lay their eggs on the milky grains of wheat, barley and oats, wheat being preferred. Whent 50 to 80 eggs are laid. The young larvae penetrate into the Jaan, upon which they feed, and at harvesting and threshing time they are carried into the barns. In the early days of July the moths the second generation appear and proceed to attack the wheat tored in the granaries, where a third and even fourth generation may be produced.

Magatiola (Cecidomyia) destructor, Say, the Hessian fly, has caused alroas damage to barley in Tunisia. In the author's experiments in life-cycle of the first generation took six weeks from the 10th falunary to the 21st March: the second generation five weeks. In camparatively hot countries like Tunisia development is arrested irrag the months of July, August, and September. On Tunisian

barley four generations were observed from November 1912 to June 1913. Heat and moisture favour the pest, as they do the plant Dryness retards development, and the author has kept pupae for a year in dry surroundings and then caused them to transform into adults by placing them in damp air. This proves that pupae left in the stubble after harvesting are able to resist the unfavourable conditions. In Tunisia numerous entomophagous parasites attack Magetiola destructor and six species of Chalcids and two species of Braconids were obtained by breeding. At the time the adults of the first generation appeared in February 1912 hardly 10 per cent, of the pupae were parasitised; of the second generation in March about 39 per cent, were parasitised, and by the end of April the figure was 84 per cent. The author discontinued observation as he believed complete control had been attained. He was therefore surprised to find a certain number of flies in the fields in February 1913. On investigating this, a number of dry-stored pupae from the Saint-Cyprien estate were examined, and it was found that while 80 per cent. had been parasitised, the remainder were still living and transformed into adults when kept in damp air for three weeks. In April and May infested barley was collected and kept dry; the parasites hatched out, but the Cecidomyias remained in a state of arrest. The damage done by this pest amounts to many millions of francs in Algeria and Tunisia. Experiments appear to prove that the more water a cereal contains the more open it is to attack. In hot, dry climates those species which contain the least water will show the most resistance. As yet the rayages in wheat in Tunisia have not reached such a pitch as to permit of picking out the varieties most capable of resistance. Barley is badly attacked, and as the most vigorous plants contain the most water, they are also the most susceptible. In spite of this they have a surplus margin of vigour which compensates to a large degree for the losses caused by the pest. Late sowing is a good preventive when the winter is sufficiently cold to hold back the pest. Where the latter is rare in October, wheat, barley and rve germinate safely if sown late. In hot climates this method has no value. In Tunisia stubble-burning between the 15th July and the 15th September is very efficacious, because the fly is then passing through its larval or nymphal stages in the arrested state, and its parasites have already emerged. Owing to the danger of field and forest fires burning is subject to certain regulations in Tunisia. These regulations also require the destruction of the debris from threshing, as this is liablto contain pupae of M. destructor. Alternation of crops would be a very practical and economical method did not the wind aid in diffusing the pest, for the Cecidomyia only spreads slowly. Of curative methods. the author states that rolling is ineffective, because of the elasticity and unevenness of the soil. Insecticides are equally ineffective, because the generations follow without any order. Pasturing sheep on infested fields and mowing the green crop may be considered in rich soils, for the larva would thus be killed before it can reach the neighbourhood of the collar. The more water a cereal contains the more susceptible it is to attack; entomophagous parasites may play an important role in control; stubble-burning destroys the pest and favours its parasite. It should be made compulsory in infested districts. The wheat weevil Calandra solution, L., attacks other cereals as well as wheat, and even Italian laste (macaroni and the like). The softer varieties of wheat are actacked before the harder ones stored in the same granary. If the social parature remains constant at 59° F, one generation would follow another: but the colder temperatures cause a break in the development. In Timisia four to six generations occur in a year according to the leadity.

LATTORICUE (G.). Les pièges alimentaires dans la lutte contre la Cochylis et l'Eudémis. [The use of bait-traps against Clysia and Polychrosis.]—Progrès Agric. Vitic., Montpellier, xxxi, no. 2, 11th Jan. 1914, pp. 38-43.

Fareful and extended experiments have shown that alcoholic fermentation must be present in the bait if the moths are to be attracted The best bait is a 10 per cent, solution of molasses, to every 22 parts of which I part of wine-lees has been added. This latter is only necessary about starting operations, as molasses solution, added to maintain the had of the liquid in the traps, is fermented by the remains of the previous filling. Captures are not influenced by the size and shape of the containers, but fermentation is inconveniently rapid in small ges, while the quantity of fluid necessary and the evaporation therefrom increase with large ones. A pot of glass, or of earthenware plazed inside, with a depth of 31 in., lip-diameter of 31 in., and bottom diameter of 2 in., has proved suitable in practice, and 53 oz. of liquid will fill it to two-thirds, this being the correct height. Two holes, under the lip and opposite each other, provide for suspension with a pace of iron wire. The pot must be placed slightly above the grapes, and in vineyards where three wires are used it is best placed close to the second wire. As the traps only attract moths in their vicinity their number must not be less than 80 per acre. Distribution must not be uniform, as the moths especially abound near buildings, hedges, dumps of trees, paths and the parts of rows most protected from prevalent winds. In such positions the traps must be closer than dewhere; nor should they be stinted if a severe attack of the pests anticipated. In 1911, 100 moths daily were taken from those examined on the 14th, 15th, 17th, 18th, 20th (oviposition began), and 23rd July. Of these 600 insects dissection showed that 322 were males, 254 were egg-bearing females, and 24 were females which had completed oviposition. On the 24th July, 39 dissections were made, 4 males and 5 egg-bearing females being found. The same search was prosecuted in 1912 with similar results and the conclusions arrived at are, that males are more numerous when the moths first emerge; bearing females are captured next this being the efficacious jerned of trapping; and finally, females which have laid their eggs predominate. Trapping is then of no further use, unless the continued capture of males prevents numbers of females from being is undated. This point requires proof. Bait-traps are thus justified, provided costs are kept down. The best system is to place all the Taps in position and only bait a few in the most likely places. These latter must be inspected regularly and on noting the first captures all the other traps must be baited and kept so until the catches diminish, when again a few of the first should be kept going-simply in order to d 26;

obtain data about the next generation. The following costs are based on practice with a vineyard of 10 hectares (25 acres): earthenware pots of the stated dimensions costing 4s. 9d. per 100 delivered at the nearest station: 3 complete fillings—1 for each generation and 15 refills—one every third day during the three 18-day average periods, each refill being of 80 c.c. (25 oz.) The total solution required (770 lb) of molasses costing 84s., and 150 litres (33 gals.) of wine-less (570 lb) of molasses costing 84s., and 150 litres (33 gals.) of wine-less spread over 5 years, giving the cost for one year's operations as 19s. The total cost of labour (30 days at 2 francs) is 48s. Thus the total expense works out at £8 16s, per annum. The traps must be inspected about twice a week and all moths captured must be removed before re-filling to the original level. This system of bait traps is emmently suitable for application by co-operative associations.

La destruction du Puceron Lanigère. [Destruction of the woolly ap]. Bull. Soc. d'Etade Vulg. Zool. Agric. Bordeaux, xiii, no. 1, Jan 1914, pp. 14-15.

Three formulae are given which, upon the advice of M. Duyaj ... Boulogne-sur Seine, have been used against the woolly aphis (8ch.) near alanigera) and have proved satisfactory. (1) In the case of $l_{\rm ext}$. and young shoots newly invaded, apply a spray made up as follows: Rain water, I litre: potassium carbonate, 4 gms.; sulphoricinate. soda, 30 gms.; methylated spirit, 30 gms.; nicotin (extract 100 gg.) per litre), 10 gms,: the potassium carbonate is dissolved in with and the other ingredients added, the solution being boiled and stime: Under the action of this spray the downy covering of the insects dissolved and the insects themselves at length destroyed. (2) In the case of attacks on older parts of the tree, the spray must be applied as soon as the white down of the insects is observed; the foregod: formula may be used, but generally it is necessary to have recomsesome stronger spray, as at this time the insects are covered with more resistant coat: the following formula is given: rain we-I litre; sulforicinate of soda, 40 gms.; American potash, 12 gm. methylated spirit, 20 gms.; and nicotin extract, 20 gms. This so tion is liable to damage the leaves more than the other, but not serious! (3) The third formula given is for destroying the eggs in winter: erecommended to fill all crevices and holes in the trunk and branches *t the end of October with the following liquid: rain water, I but black soap, 350 gms.; sulforicinate of soda, 50 gms.; the soap dissolved in warm water and the sulforicinate added, a thick syrm being formed, which can be applied with a brush. Woolly aplace which attack the roots should be destroyed at the end of Novembby opening the ground round the trees and spraying on the attack: roots the liquid recommended for the leaves and shoots.

BOUCHER (W. A.). Orchard Work for February Codlin Moth. J. Agric., Wellington, N.Z., xiii, no. 1, 1914, p. 87.

Fruit-growers in New Zealand are advised to spray with a reliable brand of arsenate of lead before the end of the second week. February. Serious infection by codling moth has often occurred in February when spraying has been discontinued at the end of January.

BURRANT (J. H.) & BEVERIDGE (W. W. O.). Army Biscuit Enquiry: Supplementary Notes.—Jl. Royal Army Med. Corps. London, xxii, no. 2, Feb. 1914, p. 208.

For practical purposes it has been necessary to ascertain the exact average dimensions of the ova of Ephestia kühniella, Z., and a table of careful measurements has been farnished by Major S. Lyle Cummins, R.A.M.C. The average length appears to be 146 (millimetres) and the breadth 0-63 (millimetres). From these measurements it would appear that if, when screening flour, a mesh of 169 strands to the inch be relied upon to eliminate the ova of E. kühniella, such reliance must rest upon the assumption that the ova of this moth always approach the screen broadside-on.

At a discussion as to the possibility of placing contracts at any specified date or dates, it was demonstrated that, so far as *E. kühniella* was concerned, any immunity from this insect cannot be hoped for during the winter months, since moths are recorded as emerging in september. October, and Kovember, and they continue to emerge eleminately in Docember, January, etc.; in fact, the species seems to be a smally an autumnal insect.

The standard of measurement of the ova is not stated, but is assured to be millimetres. Ep.[

(AMPION (H. G.). The Ravages of Bapabas piniarius in Prussia. Entomologists' Monthly Magazine, London, Feb. 1914, p. 41.

Daing a visit to the forests of the Oberforsterer of Salminuster, flexed Nassau, the author had the opportunity of seeing the great event to which the common Geometrid, Bapalos priorios, can adopt, and the damage the larvay can cause to the Scots Pine. The proformed thinness of the crown later in the summer shows seets the so called "Spanner" has been at work. The most serious first was over some lifty acres, where the trees were 60-70 years to in this area 336 paper were found within 10 square feet; a few these (some 6 or 7 only), appeared red and contained the larvae of a anknown parasite.

Jox (R. W.). The Cabbage Web-Worm. Rhodesia Agric. M., Salishary, xi, no. 3, Feb. 1914, pp. 416-422. 1 pl.

The cabbage web-worm, a pest of cabbage and affed plants, has acced serious damage from time to time in Southern Rhodesia. In the case of such plants as turnips, kohl-rabi, etc., which have swollen coans, the caterpillar usually occurs within the tissues. In young lasts of cabbage, kale, etc., the heart is attacked and the insect forms a theore in the stem and is covered by a web, under which it feeds, this insect is undoubtedly the same as that which, in the United Sales of America, is called the "imported cabbage web-worm" if illular anddids, F.) It seems to be susceptible to even light frosts and probably ranges from the Mediterranean to Southern Rhodesia of an indigenous species. Detailed descriptions of the various lifesiages are given. The different broods overlap greatly, all stages eing found throughout the growing season and during the greater (cce)

July and September is probably an important check to this past which is little attacked by parasites. Most damage seems to be do... on irrigated crops in November. Much injury may be avoided by spraying or dusting plants of the cabbage family as a prevent... measure. Any arsenical preparation may be used, such as assential of lime, arsenate of lead or Paris green, and spraying should be conmenced while the plants are in the seed bed. For use, 3 lb. of arseness of lead is added to 50 gallons of water; for Paris green, 1 lb. green and 2 lb. fresh lime (quick or water-slaked) is mixed with 160 gallons of water. In preparing arsenite of lime 1 lb. of arsenite of soda is 3. solved in a little hot water and made up to 25 gallons; 2 lb. of free; lime after slaking should be mixed with 25 gallons of water; the visit preparations can then be mixed. For dusting, use Paris green 1 ia. flour or lime 20 lb., thoroughly mixed together. For plants we'd smooth leaves a sticky substance should be added, such as a mixture of resin. This is made by boiling together 4 lb. resin, 2 lb. carbona's of soda crystals and I gallon of water. This quantity may be mixed with 50 gallons of spraying liquid and is most effective in connection with preparations containing lime. All plants should be destroyas soon as their period of usefulness is past, since such plants, cabbage stumps, etc., serve as breeding grounds for insect pests such as well worms, turnip sawfly (Atholia rosae), Bagrada bug (Bagrada hibardiamond-back moth (Plotella sp.), and cabbage aphis (Aphis brassics); all of which occur in Southern Rhodesia.

VULLET (A.). Tableaux Illustrés. [Illustrated Identification Tables. Rev. Phytopath. App., Paris, i, nos. 9-12, 5th Oct.-20th Nos. 1913, pp. 119-123, 138-140, 152-157, figs. 15. [Received 30th March 1914.]

These tables are intended to facilitate the identification of basic pests of cultivated plants in France and the neighbouring countries.

GAUMONT (L.). Contribution à l'Etude de la Biologie du Puceron Noir de la Betterave. [Contribution to the Study of the Biology the Black Aphis of the Bectroot.] -Rev. Phytopath. App., Proc. i. nos. 16 and 17, 20th Jan. and 5th Feb. 1914, pp. 4-5.

The black aphis of the beetroot (Aphis cuonymi) every year careconsiderable damage to the crops in north and central France. The insects appear at the beginning of June on the young sugar and fooler beetroots, as well as on those left for seed. They multiply abundants during summer, so that the lower leaves of the plants become yelland shrivel up and the inflorescences remain small. The sair injuries have been noticed by Jablonovsky in Hungary and by Mosil wilko in Russia. According to Mordwilko, the insects pass the winger in the egg stage on the European spindlewood (Euonymus european) L.) and alburnum (Viburnum opulus, L.) From this it would folly that destruction of these shrubs would be of great value to agriculture The author, however, has found A. enonymi also on Japanese spinale woods, which are very numerous in parks and public gardens: less even if all these shrubs were destroyed the aphis would still excl The author observed at the end of October a field of beetroots in who

tiese insects were still present, both parthenogenetic and sexual forms, and the females were laying at the bases of the leaves. When the beetroots are gathered for fodder the leaves are taken away or electric leaves and the collar, and the roots are stored in a cellar or hots. The eggs remain in the collar, batch while in the cellar and in the spring spread to Rumer, Chenopodium and other wild plants. If the heetroots are left to go to seed, the females issuing from the eggs ten new colonies at the base of the plant from which they emerge. The small beetroots are often left in the ground, and if these have eggs or them may be a means of infection in the spring. Thus it would appear that destruction of Euonymus and Viburnum would really be a little value.

MIDDLETON (T. H.).—Annual Report of Horticultural Branch, Board of Agric, and Fisheries, London, 1914, 57 pp., 8 maps.

among the insect pests which have been scheduled by the Board is the large larch sawfly (Lyggeonematus ericksonii, Hart.) Affected would in the Lake District were inspected by two of the Board's Inspectors who concluded that a recrudescence of the infestation had taken place: the intensity of the attack being higher in the Keswick district, except in Borrowdale and part of Thirlmere. The position of the infested woods and details of the attack are given. From the results it seems certain that it is not possible to rely on the presence of parasites to effect a complete extermination of the pest, the average percentage of insects found parasitised in the different woods being only about 29.4. The parasites show no tendency to increase in numbers and it would almost appear that when the number of sawflies is small the parasites turn their attention to some easier prey. Many cocoons were found in the northern woods, the contents of which had been removed, in some cases as many as those found parasitised, and a seems probable, therefore, that some other factor injurious to the sauflies is present. The condition in Wales is very satisfactory, in many places only the merest traces being found, and in others the pest was absent. The sawfly as a pest appears to have vanished from Wales, which has now resumed the same condition as obtains in the test of the Kingdom, though the number of parasites, so far as is known, was never in a higher proportion than in many parts which still remain infested. During the month of November 1912 the Board received a report of an infestation by the vine louse (Phylloxera vastatrix) in a vinery in Gloucestershire. The disease had been noticed some time, the leaves of the plants growing prematurely yellow and little or no fruit being borne, but it was not till the vines were grubbed that expert advice was taken. When an inspector from the Board called to investigate the case all the vines known to be affected had been burnt and all the soil removed from the house. It was decided to grub all the vines in a house not touched, and part of the root was submitted to the Board's entomologist, who reported the presence not only of P. vastatrix, but of Heterodera radicicola. Though Phylbisera can survive under exceptional conditions in England, it spreads extremely slowly and there is no reason for supposing that it can ever become a serious menace to English viticulture. In 1912 also a single case occurred where the larvae of the Mediterranean fruit fly (Ceratitis) capitata) survived for a considerable time in England. Larvae were found in Seville oranges and puparia were obtained from the tissue paper in which an Almerian orange was wrapped. As far back as 1868 the fly was recorded in England, having been bred from oranges, and hundreds of these larvae or pupae are imported every year inside oranges, and are killed in the preparation of marmalade. The presumption is, therefore, that the same conditions which have according unfavourably to the cherry fly (Rhagoletis cerusi) in this country, will stop the development of Cerutitis also.

The season of 1942-43 produced very few new conditions in the state of Isle of Wight Disease among bees. Reports of its presence from certain districts were received and from time to time it appeared epizootically in different counties. No treatment has been regularly successful in effecting more than a temporary improvement.

La lutte contre les sauterelles: résultat des expériences de 1913. [Locust control, results from experiments in 1913.]—Bull, birmers, Off. Gone, Gén. Alger., Paris, xx, no. 2, 15th Jan. 1914, p. 26.

This article gives the detailed information supplied by M. Vermed, Director of Agriculture for the Province of Oran, who was sent by the Algerian Government to watch the tests made in the Tagrenaget district by Dr. Sergent, Director of the Pasteur Institute in Algeria, with the Coccobacillus employed by d'Hérelle in the Argentine against locusts. The hoppers experimented on had hatched from eggs lad in the previous autumn by Stauronotus maroccanois. Dr. Serger first ascertained them to be free from d'Hérelle's Coccobacillus, A batch was inoculated with pure bouillon and remained healthy, while individuals of another batch inoculated with infected bouillon began to die on the third day, and all rapidly perished except two or three which remained immune right through. The blood of the dying hoppers was used to prepare fresh and more virulent cultures; and after the virus had been passed through 11 locusts it caused death in 7 hours. A further 4 or 5 passages did not reduce this period of time. and Dr. Sergent considered this to be the minimum. Later on, however, Dr. Sergent experimented with adult locusts in the district of Beni-Ounif and was able to cause death in one hour. M. d'Hérele states that by spraying the grass and the insects about 95 per cent. of the latter will be infected and killed. In the experiments made by Dr. Sergent to ascertain this point a negative result was obtained. After several days about 95 per cent, were very much alive. Of course, this method would in any case be impracticable owing to the quantity of spray necessary, and M. d'Hérelle reported that only the leaders of a column required spraying in order to provoke a spread of infection throughout the locust army. This was also tested, but after some 100,000 to 150,000 hoppers had passed over infected ground, and that leaders had been sprayed as directed, it was difficult to find any dead except a few which appeared to have been the victims of insect-eating spiders. In spite of the care and patience with which all these tests were made their ill-success was clearly apparent. The evident contradiction may perhaps be explained by one of the following considerations: (1) M. d'Hérelle may have been too sanguine, and the insects may have died quite independently of the Coccobacillus found in their

by hes; (2) it may be due to the fact that he experimented only on Sh/shoreren pullens and S, puranensis; (3) he used adult locusts and not hoppers, and that insects resist the bacillus least when they are parest death is a well-known theory; or (4) his success may be due to the fact that the climate of Argentina, where M, d'Hérelle worked, a warner and moister than that of the Tagremaret district; these two factors are always of great importance in insect life. Dr. Sergent is continuing his experiments with the hope of getting practical results.

j D. Die Kosten der Schädlingsbekämpfung. [The cost of combating pests.] Laxemburger Weinzty., Grevenmacher, ii, no. 1, 1st Jan. 1914, pp. 12-14.

As the calculations published by numerous journals differ rather considerably, the author gives the costs based on his personal experience and on accurate data collected from vine-growers. They cover the cost of the material necessary for a rational and thorough campaign against plant and animal enemies of the grape vine, but do not include cartage, wages, or any other cultural expenses.

Spraying against Peronospora. A 2 per cent. Bordeaux mixture was applied three times a year on an average. To be of use, thorough spraying is essential and for this 194 gals, of mixture, or 39 lb, of copper-sulphate and 39 lb, of lime, are required per acre for each application. The Grevenmacher Vine-growers' Association supplies its members with Bordeaux mixture ready for use at approximately 4, for 20 gals. This entails an outlay of £1 9s, 6d, per acre for three applications and the protection of the 4,000 odd acres of vineyards in Luxemburg means an expenditure of £5,900.

Supporting. As a rule three applications are necessary, and for these 66 lb, of sulphur are required per acre at a cost of about 9s, per 100 lb. This works out at about 6s, per acre, or £1,200 for the 4,000 acres of vineyards in Luxemburg.

Udw-moth control. According to tests made in 1913, it is necessary to spray with nicotin twice a year if any result worthy of the name is to be attained. It appears best to make up 22 gals, of spray solution with 3 lb. 3 oz. of copper-sulphate, 3 lb. 3 oz. of nicotin extract at le. ld. per lb. and 1 lb. 10 oz. of soft soap. This costs about 4x. 6d. For a single application 132 gals, are required per acre, or 264 gals, a sear. The cost per acre per year is about 54s., and the expenditure for Luxemburg would be about £10,800. The total expenditure for Lowenburg will amount to over £18,000 per year, or £4 10s, per acre. As already stated this only covers cost of material required for control galposes.

SHILLING (K.). Sur Bekämpfung des Heu- und Sauerwurms. [Combating the vine-moth.]—Luxemburger Weinztg., Grevenmacher, ii, no. 2, 15th Jan. 1914, pp. 28-30

At Geisenheim vine-moth control in 1913 included several trials which gave results as follows:—The insecticide "Golazin Ptötsi" was used with success against the second generation of the vine-moth and the grapes remained unharmed. They were also free from stem-rot. A quart of this insecticide cost 3s. 5d., and 2 quarts diluted in 25 gals. If water at once gave the 2 per cent. working solution. On an average

158 gals, are required per acre. Spraying must always be effected in the period from the end of the moth-flight up to the appearance of the first caterpillars. High pressure sprayers are the best, and every grape must be thoroughly wetted. A single application of this insect. cide costs about £5-15s, per acre. The makers state that if applied in the same manner it is equally effective against the first generation. Apparatus used with Golazin must be thoroughly cleansed with a per cent, solution of ammonia before it is employed with copper sulphate. Nicotin soap gave very fine results. The spray was madup of 20 gals, of a ½ per cent, lime-copper-sulphate solution, 4½ oz. is 90 per cent, purified nicotin and 2 lb, of soft soap. The soap is dis solved in a known quantity of boiling water, the nicotin is slowly and carefully mixed in and the lime-copper-sulphate solution is finally added. Before this latter solution is added its strength must be greater than I per cent., as the amount of water used for dissolving the soan must be exactly allowed for. Nicotin-soap is mainly a control of the second generation and must be applied immediately the moth-flight is over that is, from the 25th July onwards. Spraying is carried out as with Golazin. On an average 123 gals, are required per acre, and one man with two boys can cover that area in three days. Under local conditions the total expense will be about £3 4s. per acre. The same preparation, omitting the copper-lime mixture, was also tried but the results were not so good. The treated grapes matured in a healthy condition, but took from two to three weeks longer to do than those sprayed with Golazin. In making up the insecticide both the nicotin and the soap must be of the best quality. Cottonseed oil soap is the best. A third test was made with a Hungarian produc called "Kochillin" and was successful, although ripening was a little delayed. Kochillin is applied immediately after the vines are in flower, or immediately after the moth-flight of the second generation. It costs 2s, a lb, and is used as a 2 per cent, solution.

Die Bekämpfung des Heu- und Sauerwurms im Rheingau mit einem Schweizer Insektizid. [Combating the vine moth in Rheingac with a Swiss insecticide.] "Neue Zürcher Zeitung, Zürich, no. 34. Viertes Morgenblatt, 9th Dec. 1913.

The grape yield of 1913 has been the worst on record. Sor growers, however, obtained remarkable results in combating the visuality moth, which had generally been considered as beyond control, as averaged from one-third to one-half grape yield. The trials as referred to above, but the following data are new: In a vineyard about 875 square yards treated with "Golazin I tötsi" about 104 gor about 875 square yards treated with "Golazin I tötsi" about 104 gor unireated one about 2,960 square yards only produced 82 gallons. If the former case treatment resulted in a full harvest.

VUILLET (A.). Stephanoderes coffeae.—L'Agronomie Coloniale. Paris. 31st Jan. 1914, i, no. 7, pp. 19-21.

Last September the Jardin Colonial received from the Lieutenant Governor of the Gaboou a consignment of Liberian coffee berries attacked by a Scolytid beetle, which was found to be Stephanoderes coffee. Hag. The female deposits an egg in the young fruit while it is still

green, towards the extremity or just above the scar left by the perianth. After about 8 or 12 days a white larvae emerges and penetrates into the berry. The larvae completes its growth in three or four weeks and pupates in the seed, the adult insect appearing 15 to 19 days later. The presence of the beetle is revealed by two or three small holes, at the summit of the fruit. The pulp is simply crossed by the insect, and only the seeds are devoured by the larvae, so that at a certain distance the berries appear in good condition, containing only damaged and is by gathering and destroying the attacked berries. This species proves to be widespread; the specimens originally described came from Uganda, but Hagedorn has since received examples from Angola, the Congo and Java. According to Morstatt it did not exist in German East Africa in 1912. In Uganda Coffea arabica appeared to suffer less from the attacks of this insect than indigenous coffee trees.

Verwendung des Karbolineums an Obstbäumen. [The use of Carbolineum on fruit trees.] Schweiz. Zeits. Obst- und Weinhau, Finaenfeld. 12th Jan. 1914, pp. 8-10.

In this article reference is made to a paper by Wenk in the Geisen-Loner Mitteilungen über Obst und Gartenbau, and the following remarks are all taken from it. The incorrect use of carbolineum has led to its being discarded entirely by many experts. If properly applied it is a valuable agent. Scale-insects are easily destroyed if the trunk and branches of the tree are painted with a 40 per cent, solution. This strength kills the scales, which is not always the case with weaker solutions. Spraying must not be done with solutions above 15 per cent, in strength, as the young shoots and bilds will suffer. It is of the greatest importance that carbolineum be used only when the sap flow is in abevance. From the beginning of February to the middle of March is the period advised by Wenk, as then the insects are leaving their winter refuges and, on the other hand, shoots and buds have not vet appeared. When they do so the use of carbolineum must be immediately discontinued. The product itself must be completely soluble in water and the actual percentage of carbolineum contained in it is of great importance, and should be guaranteed, as some inferior makes may contain over 90 per cent, of water and would prove very expensive in use, [See this Review, Ser. A. ii, p. 210.]

PIERCE (W. D.). New Potato Weevils from Andean South America. – Jl. Agric. Research, Washington, i, no. 4, Jan. 1914, pp. 347-352, 3 pl.

Potatoes sent to the United States from South America were found on several occasions to contain weevils, in all stages of development. Three species of weevil are involved, one of which, Rhigopsidius to anamanus, Hiller, has been already reported as found in potatoes shipped from Chile, Peru and Bolivia. [See this Review Ser. A. I, p. 546.] The other two species, described in the present paper, are new and represent new genera. One of these, Premotrypes solani, was found in the adult stage, just under the skin of the potato, in a small cell in which the larva had evidently fed; from the material

received it is judged that the larva does not bore extensively into the potato. The other species, *Trypopremnon lotithorax*, was found in cells in potatoes received from Peru; it breeds in a manner closely resembling that of *P. soluni*.

BALLARD (W. S.) & VOLCK (W. H.) Winter Spraying with Solutions of Nitrate of Soda. Jl. Agric. Research, Washington, i, no. 5, Feb. 1914, pp. 437-444, 2 pls.

The main object of the experiments set forth in this paper was not so much the destruction of insect or fungus pests, as an attempt to feed trees and shorten their dormant period by spraying with nitrate solution, and the results, from this point of view, are interesting. The solution found to be most satisfactory consisted of nitrate of soda 200 lb., caustic soda 25 lb., water 200 gals. The result was to force the dormant buds out several days ahead of the normal opening period, and the apparent strengthening and increase of vigour of the trees was possibly useful in enabling them to resist the attack of insect and fungus pests.

CHATTERJEE (H. C.). A Note on Oxyrhachys tarandus, Fabr. Ind. Forester, Allahabad, xl. no. 2, 15th Feb. 1914, pp. 75-79, 2 pls.

Oxyrhachys tarandus (MEMBRACIDAE) occurs in many parts of India and is widely distributed in Africa. Among its food-plants are Acadia siamen, A. arabica, and Casaarina sp., reported from Madras; Cassa fistula and A. arabica, reported from Bihar (Pusa); A. catecha, Albicoa lebbek, Albizzia procera, Phyllanthus emblica, Tamarindus indica and Dalbergia latifolia, from Dehra Dun District. Injury is caused by the insertion of the proboscis into the young stems in order to suck say. and to a greater extent by the incisions made by the saw-like ovipositor of the female while laving her eggs. The trees attacked become stunted and more exposed to the attacks of other insects. The eggs are laid in the bark of the young shoot, but there is very little definite information as to the length of the life-cycle. Descriptions are given of the egg, larva, nymph and adult. Until the life-history of this insect is worked out, no proper remedies can be laid down. In small nurseries and gardens where the insect is abundant the following measurements ures may be adopted; spraying with kerosene and soap emulsion. keeping the ground between the trees clean and constantly ploughed. and handpicking. The eggs of O. tarandus have been found parasitised by a Chalcid.

TRÄGÅRDH (I.). Gran- och tallkottarnes vanligaste skädeinsekter. [The most common insect pests of pine and fir-cones.]—Skogen. Stockholm, i, no. 2, Feb. 1914, pp. 42-50, 5 figs.

Pissodes calidirostris, Gyl., has on several occasions done great harm to fir-cones. The adult makes its appearance in July in the neighbourhood of Stockholm and feeds on the young cones; the larva hibernates in the middle of the cones and pupates in the spring, only one generation occurring a year. The attacked cones are easily recognised by their pale brownish yellow colour, which contrasts with

the green colour of the undamaged cones. They are very easily shaken off the trees, which makes it very probable that, as a rule, they drop to the ground before they are ripe. In 1907, on the island of Gotland, 22.27 per cent, of the cones were damaged by this weevil. This year Mjoherg found no less than 80 per cent, of the larvae parasitised, a fact which seems to indicate a possible method of fighting the insect. The Anobiid beetle, Ernobius abictis, makes its appearance in July; the amount of damage it does in Sweden is not known

Laspeyresia strobilella occurs throughout Sweden to Lapland. The renes attacked by the caterpillar very often do not differ in appearance from healthy cones. In the autumn the larva does very little damage to the cones, only 6-40 per cent, of the seeds being devoured, but if they are stored in a warm room during the winter the seeds are attacked one after the other, so that by April or May all of them are rate. It follows from this that the earlier the seeds are shelled the better.

Another cone moth, Dioryctria abictella, has not been recorded as doing any harm until last summer, when the author found it plentiful everywhere in the vicinity of Stockholm. Its mode of attacking the cones differs greatly from that of L. strobilella, it being much larger and accomplishing its feeding in the autumn. As a consequence it devours a much greater part of the cone than strobilella, and furthermore it throws out heaps of frass on the surface of the cone. It makes aiming galleries in the centre of the cone, feeding on the seeds and on the basal parts of the scales, the latter becoming anchor-shaped, as aheady observed by German entomologists.

The seeds of these conifers are also attacked by an, as yet, undescribed Chalcid of the genus *Megastigmus*, and by gall-midges which are not identical with those described from Austria.

SMITH (H. S.). Mealy Bug Parasites in the Far East. Mildy, Bull. State Comm. Hortic., Sucramento, Cal., iii, no. 1, Jan. 1914, pp. 26-29.

In this paper the author reports on his visit to Japan and the Philipthes with a view of obtaining natural enemies for Californian pests. Attention was first turned to the enemies of Pseudococcus citri. In Japan, where the mealy bug is never a pest of any importance, three chemies of this insect were found. One is a ladybird, the name of which is unknown to the author; it resembles Cryptolaemus montronwith the others are parasitic wasps, a small metallic blue Encyrtid and a Proctotrupid, which lay their eggs in the very young mealy bugs. A good breeding stock of these parasites is now in the insectary in California. In the Philippines P. citri was not encountered, though a similar species occurs, and the ladybirds Pullus fuscatus and Aspidinarus orbiculus were found feeding on it. Spalgis substrigata was found to be a very important factor in the control of mealy bugs. A single larva of this butterfly would frequently clear an entire twig of nealy bug larvae and eggs; but this type of insect is very difficult to breed in confinement. Two species of Chalcid flies were also found attacking Pseudococcus, but to a far less extent than the foregoing lisects. Two species of Diptera of the genus Diplosis do good work against mealy bugs of guava and Hibiscus in the Philippines, feeding in the larval stage upon the eggs and young. Several other enemies

of the mealy bug are found in the Orient, but they are of minor importance. In the vicinity of Manila a number of parasites of Saissata hemisphaerica were obtained in the hope that they would attack its black scale in California. This they seem to do in the insectary, but they have not been tried in the field. One Pteronalid attacks they says of the scale. Two other Encyrtids attack the young scale beforeggs are laid. Tentative arrangements have been entered into with the Imperial Department of Agriculture of the Japanese Government and the Bureau of Agriculture of the Government of the Philippines for co-operation with the State Commission of Horticulture at Sayra mento in the attempt to introduce the natural enemics of Californian pests.

COOK (A. J.). The White Grubs, Mthly, Bull. State Comm. Horter, Sucramento, Cal., iii, no. 1, Jan. 1914, pp. 29-30, 1 fig.

White grubs (the larvae of various Scarabaeid beetles) feed on rocs of grasses and other plants. The rose chafer, Macrodaetylus subspinosus, of the Eastern States causes much damage. The varios, May beetles are also serious pests, devastating lawns and meadors and working havoc in strawberry beds and among vegetables. The common one in California is Ligyrus gibbosus, and in Michigan Lawnosterna fasca. As a control measure, if the meadow is seriously attacked, it should be ploughed up and some other crop grown. A badly attacked lawn can be treated in the same way and clover may be substituted, as it is not affected. On lawns, carbon bisulphid-can be used, 4 oz. of the liquid being poured into holes about three feet apart, which should at once be closed.

ESSIG (E. O.) The Cherry Fruit Sawfly. Mthly. Bull. State Comm. Hortic., Sucramento, Cal., iii, no. 1, Jan. 1914, pp. 31-35, 3 figs.

The cherry fruit sawfly (Hoplocampa cookei) was first reported from the Suisan Valley, Cal., in 1883. It is a native of California and other Pacific Coast States. Considerable damage has been done to cherry crops by the larvae, the injury consisting of one or more clean round holes bored through the fruit to the kernel, which, if soft, is devoured as well as the fleshy part around it. The fruit becomes discoloured and falls to the ground. It is stated that in order to control this sawfly effectively, from two to three applications of lead arsenate, at the rate of 4 to 5 lb. of arsenate to 100 gals. of water, may be necessary As a rule two good applications are sufficient, the first being made shortly before the blossoms open and the second about ten days later Autumn ploughing is recommended to kill the larvae and pupaging the soil. A 3 per cent. distillate-oil emulsion, to which has been added nicotin sulphate at the rate of one part to 2,000 parts of water, his also been suggested. The insect has been reported as occurring in the Suisan Valley, El Dorado and Nevada counties, California, and at Medford, Oregon, where it is confined to a very small area. The orchard fruits reported to have been attacked are cherry (sweet and sour), prune, plum, peach and apricot (the last two only occasionally

Vac (A. J.). The Cherry and Pear Slug.—Mthly, Bull, State Comm. Hortic., Sacramento, Cal., iii, no. 1, Jan. 1914, pp. 40-41, 1 fig.

The pear slug Eriocampoides (Caliroa) cerasi, is a sawily of European again and is widely distributed, occurring wherever the cherry and year are cultivated. The eggs are deposited in the stem or leaf in law spring and early summer. The larvae feed on the green parts of the leaves, attacking chiefly the cherry and pear. Arsenicals are very effective against these insects, but, owing to their viscid secretion, line or even earth-dust thrown on them is an excellent means of destroying them.

FINNEETT (H. S.). Does Bordeaux Paste cause Injury when followed by Fumigation?—Mthly. Bull. State Comm. Hortic., Sucramento, Cal., iii. no. 1, Jan. 1914, pp. 41-43, 1 fig.

It has been noticed that if spraying with Bordeaux mixture is followed too soon by funigation with hydrocyanic acid gas, the trees are more likely to be injured than those not sprayed, resulting in partial defoliation and killing back of the small twigs. This does not seem to be true in the case of lime-sulphur spraying. Trees were treated with Bordeaux paste on the trunks and fumigated soon afterwards: no apparent injury resulted. This has been successfully repeated several times. It would, therefore, seem that where the proper precautions as to weather and moisture conditions are observed by the fumigator, there is no injury to be feared from the Bordeaux baste, even when applied to the large limbs.

Esse: (E. O.). Insect Notes,—Mthly. Bull. State Comm. Hortic., Sucramento, Cal., iii, no. 1, Jan. 1914, p. 47.

The sweet-birch scale, Chionaspis salicis-nigrae, Walsh, was taken by the author recently in the Sierra Nevada Mountains, where it appears to be common, east of the Sacramento Valley. The sweet birch, Conathus integerrimus, H. & A., is generally attacked at the base hear the ground, and the infested areas appear as if whitewashed. In not a few cases the entire bush was killed by this insect. The pineral scale, C. pinifolia, is exceedingly common on Pinus ponderosa, bond, in the vicinity of Forest Hill (Placer County), as also is the black pine-needle scale, Aspidiotus californicus, Colm. In the same county Kermes cockerelli, Ehrh., and Aspidiotus densiforue, Bremner, herms taken from Quercus chrysolepis. The destructive grasshoppers, Melanoplus devastator, Scudd., M. cinereus and Schistocerca venusta, Scudd., were found along the north fork of the American River.

Cong (A. J.). Alfalfa,—Mthly. Bull. State Comm. Hortic., Sucramento, Cal., iii, no. 2, Feb. 1914, pp. 53-73, 17 figs.

In a lengthy article on the cultivation of alfalfa, the author notes among the pests of this crop in California the following insects:—

the worm (Peridroma margaritosa var. sancia), locusts (ACRIDHDAE),

the alfalfa butterfly (Colias eurytheme), wireworms (ELATERHDAE),

the alfalfa looper (Antographa gamma californica), the alfalfa crane-fly

Tipula simplex), the apple leaf-hopper (Empousea muli), clover mite

Ecyclin protensis), grain thrips (Euthrips tritici), grass leaf-hopper

(Typhlocyba comes), the twelve-spotted cucumber beetle (Diabrotica soror), the western army worm (Chorizagrotis agrestis) and the serpentine leaf-miner (Agromyza posilla). Poisoned bran-mash placed in affected areas kills both the army worms and locusts. The hopper-dozer, with a shallow pan of kerosene oil, drawn through the field will often capture the hoppers by the millions. The alfafa weevil, Phytomomos positions, has not yet been found in California. [For list of Russlan and European pests of lucerne, see this Review, Scr. A. i. pp. 526-27.

CHILDS (L.). The Large Narcissus Bulb Fly.—(Merodon equestris, Fab. Mibby, Bull. State Comm. Hortic., Sacramento, Cal., iii, 10, 2, Feb. 1914, pp. 73-76, 2 figs.

This thy, belonging to the family Syrphidae, in the larval stageauses much damage to narcissus bulbs. The native habitat of Mexidon equestris is Southern Europe, whence it has spread into England and Northern Europe and later to America and New Zealand. The larva feeds vigorously on the soft scale of the bulb, hollowing our the centre, so that infestation is often difficult to detect. The farva pupa and adult are described. The eggs are laid at the base of the leaves and the larvae later bore into the bulb. The treatment of infested bulbs has been dealt with by Mr. R. Stewart MacDougali [see this Review, Ser. A. ii, pp. 88-89.] The following plants have also been reported to have been attacked by M. equestris: Amarglis, Vollota, Habrauthus, Euryeles, Saltonia, and the bulbs of the will hyacinth. Scilla natoris.

SMITH (H. 8.). The Season's Work with Hippodamia convergens, Mildg. Boll. State Comm. Hortic., Sucremento, Cal., iii, no. 2, Feb. 1914, pp. 77-78.

During the season of 1914 it is hoped to carry on the distribution of this beneficial insect on a greater scale than in the past. Mr. Braair a reports a number of colonies, not before utilised, in the Sierras, and it is hoped to exceed the hundred million before the end of the year. Owing to the repeated damage caused by Aphis arenae to barley from February until the melon aphis season, it is proposed to release Happer damin converges upon the barley aphis during February, and by the means it is hoped to check the melon aphis plague in Imperial County.

NAKAYAMA (8.). A Japanese Formula for Destroying the Woolly Aphis. Mildy. Bull. State Comm. Hortic., Sucramento, Cal., iii. no 2. Feb. 1914, p. 80.

Mr. T. Machida, of Japan, recommends for the woolly aphis the following mixture:—Rape-seed oil, 3\frac{1}{3} pints: sulphur, 1\frac{1}{2} oz.; turpentine, 7\frac{1}{4} oz. The rape-seed oil should be boiled alone for a short time and then the turpentine slowly added and thoroughly mixed. Next stir in the crushed sulphur. The attacked parts of the tree are painted with this wash, which is also recommended for other aphids and for the destruction of their eggs.

VOSLER (E. J.). Calendar of Insect Pests and Plant Diseases. Milly, Bull. Sta. Comm. Hortic., Sacramento, Cal., iii, no. 2, Feb. 1914, pp. 81-85.

The author suggests the following methods of control for insect posts to be carried out at about the time he writes. The almond mite, the eggs of which are deposited in the autumn on the twigs, hatches in spring and damages the tender growth. Commercial lime-sulphur Julion with flour paste seems effective in the control of this pest. The following formula is suggested: -100 gals, water, 4 gals, flour paste, 5 quarts lime-sulphur solution, 2 lb. iron-sulphate. Another bute destructive to fruit is the pear-leaf blister mite, which can only be controlled commercially in the adult stage, as the eggs and young are poside the leaves. A. L. Quaintance recommends a lime sulphur wash of 20 lb. lime, 15 lb. sulphur, and water to make 50 gallons. The application should be made just before the leaves are out. The spring valker worms, attacking the foliage of the elin, cherry and prine, may cause entire defoliation of their host. In early spring the wingless totale moth crawls up the tree to deposit its eggs on the bark. Tree to glefoot or any adhesive bands will prevent the ascent of the female, and the eggs laid below the bands can be readily destroyed. Arsenate Abad, 5 lb, to 100 gals, of water, sprayed on the foliage will destroy the young caterpillars. The government formula for spraying pear thus consists of 3 per cent, distillate emulsion combined with "Blackket 40.7 I to 2.000 parts of water. Among the citrus fruit insects the cras mealy bug is discussed. E. O. Essig finds that a carbolic acid capilsion spray, plentifully applied (10 to 15 gallons to an averagesold tree), is the best remedy. Sometimes two or four applications, a seek apart, are necessary; winter or early spring spraying seems the Fumigation has given good results, but has not been so effective is the emulsion. The ordinary black scale dosage is the one generally and. No practical remedy for the grain aphis, at the time they appear in spring, is known. The asparagus beetle appears as soon as the asparagus shoots emerge from the ground. Control measures used sponst this insect consist of cutting and burning egg-infested shoots, Lafter the crop has been harvested, spraying the plants with arsenisprays, using 1 lb, of arsenate of lead to 16 gallons of water.

Essic (E. O.). Insect Notes. -Mthly. Bull. State Comm. Hortic, Sucrawento, Cal., iii, no. 2, Feb. 1914, p. 85.

J. P. Lyons reports Aphis avenae, F., doing serious damage to oats in the Imperial Valley. The maple plant louse (Drepanaphis averibili. Thos.) has been reported as occurring on maple at Hanford, tal. and the author has repeatedly taken it at Sacramento. Aspidious princiosus, Comst., has been found in large numbers in pear orchards in Yolo County, near Sacramento, and A. hederae has been found on palm leaves. The following species of Pseudococcus have been taken in the vicinity of Upland, Cal.:—P. crawii on white sage; P. arterisine on Artemisia californica; P. bakeri on the foliage and fruits of stanges and lemons, roots of nightshade (Solanum douglasti) and wild sunflower, also upon Grevillea, ivy, Senecio and other ornamental

plants; and P. solani on the roots of nightshade, wild sunflower and tomatoes. Tortrix citrana is also common in Upland on orange trees.

VASSILIEV (Е. М.). Два новыхъ для Россіи вредителя сахарной свекловицы изъ Турнестана. [Two insect-pests of sugar-lost from Turkestan, new to Russia.] «Въстникъ Сахарной Промышленности.» [Herabl of the Sugar-Industry]. Kiev., no. 3, 1st Feb. 1914, pp. 68-75.

Before the establishment of the Entomological Station of Turkestan in Tashkent in 1944, very little was known of the insects injurious to sugar beets in that country. In an article by the author published in 1906 he recorded some of these, namely, Stauronotus maroceanus, This. Chloridea obsoleta, F., and the larvae of an unknown species of ELATERIDAE. In the first report of the above station, published in 1912, two new pests of sugar-beets are mentioned: Laphygma eriq a. Hb., and Phlyetuenodes midalis, Hb. According to the author, the latter insect is quite a new pest of sugar-beet, as up till now only two species of the genus Phlyctaenodes were reported as injurious to this plant, P. stieticulis, L., and P. similalis, Guen. The information given in the report as to P, nodalis is very scanty, only the damage done by the caterpillars to the young central leaves being mentioned. As to the natural food-plants of this species, only Camphorosma annua, Pail. (Chenopodiaceae) and Echium (Boraginaceae) have been previously recorded. The author suggests the following remedies: (1) the destruction of weed grasses; (2) the destruction by burning or by naphtha of the sprouts of beet taken out while digging; and (3) the catching of the insects on fermenting molasses.

The geographical distribution of Laphyqma exiqua is very great, a being found in Europe, Asia, Africa and America. The caterpillars injure maize and potatoes in South Europe; maize, beet and cotton seed in North America; cotton seed, lucerne, maize and sugar-cane in Egypt; and, in addition to all these plants, also cabbage, Hilbiscus. Corchorus, Carthamus, Amaranthus, lentils, etc., and especially Indiquefera tinctoria in India, where they are most injurious. In Russian Turkestan injury by this pest was noticed from the beginning of June 1911; in one locality in the district of Tashkent they devouted in 1911 about 540 acres of beet-root, in addition to damaging various other crops. In Turkestan the insect winters in the pupal stage. whereas in North America it is the moths that hibernate. of generations of this pest is two in America, three in Southern California and two (May-June and September) in Europe; the number of generations in Turkestan is unknown. As enemies, Tachinids are mentioned, which are responsible for the destruction of about 30 per cent. of the caterpillars in India, also a Sphegid wasp (Ammophila sp.) some predaceous beetles, bugs (Canthacona furcellata in India) and birds. Nothing is known of its enemies in Turkestan or Astrachan.

The following remedies are suggested. Against the imago, trapping with fermenting molasses; it is important to set the traps before oviposition has taken place. In India, the eggs are collected by hand, and lucerne is grown as a bait plant, being cut and destroyed at the proper time. The author suggests also the removal from the plantations and the destruction of weeds and all plants which have been heed up.

Against the caterpillars, spraying with a solution of Paris green and lime in water (1-1½ oz. of green and the same amount of lime in 2-7 gillons of water) is considered the best remedy in Turkestan; "Djipsin" and barium chloride gave negative results. In India and North America arsenical sprays are used, and also kerosene combision in America. In India the attacked fields are surrounded by trenches as maps. Against the puppe, the cultivation of the soil is suggested by Pictuikov; it has also been noticed that the puppe perished when mater was poured over them, so that by combining spraying and waterigt the pests may be rapidly destroyed.

[n xx (C. A.). Grasshopper Control Work in Western Kansas. "II. Econ. Entom., Concord., vii, no. 1, Feb. 1914, pp. 67-73, 2 pl.

A very successful campaign against grasshoppers was carried out in the summer of 1913 in Western Kansas, where for some years past these insects had devastated acres of cultivated land. The most manon species were Milneophus differentialis, M. bicutatus, and M. Paris. In the control work poisoned bran mash, made according to the following formula, was used: Bran 20 lbs. Paris green Ilb., stip 2 qts., 3 oranges or lemons, water 3½ gals. The bait when troomed with oranges or lemons was found to be more attractive to the grasshoppers. The damp mash was sown broadcast in the infested area early in the morning; using the above quantities it should be eattered so that 5 acres are covered. As the poison does not act mickly the insects are not found dead until two or three days later. A very small quantity of the poison is sufficient to cause death.

The success met with in the campaign described in the present paper so largely due to the co-operation of most of the farmers with the entry commissioners, who had circularised the farmers giving them is exact methods to adopt and supplying them with the necessary gredients for the poison. In some counties 60-70 per cent, of the resets were killed, in others as many as 90 per cent.; in all cases the a that remained were kept in check by their natural enemies.

WYER (S. J.) & CLAASSEN (P. W.). Grasshopper Control in the Southern Division of Kansas.—Jl. Econ. Entom., Concord., vii, no. 1, Feb. 1914, pp. 73-83, 3 pl.

The University of Kansas, which for several years has been associated with the problem of grasshopper control in the State, organised in 1913 campaign against these insects, which received the co-operation of most of the farmers of Southern Kansas. The method of control employed, similar to that employed in Western Kansas, consisted of activiting poisoned bran mash in the infested areas. The formula for the bran mash was as follows: Paris green or white arsenic 2½ lb., fran 50 lb., 6 oranges or lemons, syrup 4 qts., water 5 gals. The dry arredients are mixed together, and then the syrup and oranges or amons; the water is not added until the day of use. The bait is attered broadcast in the infested areas between 5 and 7 o'clock in the morning.

Chickens eating the poisoned grasshoppers do not appear to be affected. The bran mash loses its effect as soon as it is dry. In alfalf4 fields about 240,000 grasshoppers were killed per acre with one application. Poison for this experiment was scattered broadcast through the field, using 4.5 lb. to the acre at a cost of not over 6/l, per acre. This was carried out in a field where the alfalfa was fully grown; a more effective means is the mowing of the field, leaving strips of standing alfalfa 1-6 feet wide and about 75 yards apart. The grasshoppers soon collect in these strips and are thus readily poisoned with small amounts of the bran mash, or easily caught with the hopper dozer. By these means a grower of the largest crops of alfalfa was able to harvest three crops before the first of August, where in an untreated field, kept as a control near by, only one crop was harvested in the same time.

Experiments were made to determine the attractiveness for the insects of baits where the expensive lemons were replaced with loss expensive ingredients such as anise oil, stale beer, or vinegar, or left out altogether. The experiments showed that the insect has a keen sense of smell and is easily attracted to the bait put out for it: lemons render the bait 26:5 per cent, more effective than any of the other ingredients tried.

BURGESS (A. F.). Outline of the work on the Gipsy Moth and Browntail Moth conducted by the Bureau of Entomology, U.S. Department of Agriculture. "Jl. Econ. Entom., Concord., vii, no. 1, Feb. 1914. pp. 83-87.

The author gives an account of the methods adopted to prevent the spread of the gipsy moth (Lymanteia dispar) and brown-tail mats (Enproctis chrysorthea) from the infested region in New England to other parts of the United States. The experimental work consists of the study of the life-history and habits of parasitic and predaceous enemies, with a view to propagating them in the infester areas; field observation work is done during the summer and autum. and records kept of the increase or decrease of the species in a givearea, and of the defoliation on the trees concerned; food-plant work is carried on in the laboratory, caterpillars of the gipsy moth being fell on selected food-plants, and records kept of their preferences for different plants; factors concerned with spread of the insect are investigated, such as wind, temperature, etc. Investigations on the wilt disease, which attacks the gipsy moth caterpillars and destroylarge numbers of them, are being conducted. Many trees that have been defoliated by the gipsy moth are attacked by bark borets (SCOLYTIDAE): oak trees suffer seriously in this respect: attempts are being made to determine whether such pests can be controlled economically.

Work is being done in co-operation with the Forest Service to determine whether different species of timber trees are more or less resistant to moth attacks. The territory infested by the gipsy moth and brown-tail moth has been placed under quarantine, and regulationable been made providing for the inspection of forest and nursely stock that is shipped from the infested territory to other parts of the United States. The country adjoining the infested territory is under inspection.

ROWLERS (D. M.). The Gipsy and Brown-tail Moth Quarantine. Jl. Econ. Entom. Concord., vii, no. 1, Feb. 1914, pp. 116-117.

An account is given of what is being done by the U.S. Department of Agriculture to prevent the spread, by the inspection of various gradiets, of the gipsy and brown-tail moths. The area quarantined on account of the gipsy moth includes parts of Maine, New Hampshire, Massachusetts and Rhode Island about 15,230 square miles. The arown-tail moth area includes all the gipsy moth area and about 17,000 square miles in addition, affecting portions of each of the New England States. The inspection of plants and forest products includes the examination of lumber, cordwood, logs, poles, posts, bark, pulp acod, rough lumber used in crating finished products, barrel hoops, barrels, boxes and other products which might be chosen by a gipsy noth as a place on which to deposit her eggs. Many commodities not crictly included in products of the forest were examined, such as some taken from quarries in woodlands in the infected areas, on which egg clusters are often deposited.

PAVIDSON (W. M.). Plant-Louse Notes from California. - Jl. Econ. Entom., Concord., vii, no. 1, Feb. 1914, pp. 127-136, 8 figs.

The following species of APHIDIDAE have been taken in different parts of California, and short notes are given of their mode of occurrence, agrating habits, life-histories, etc.: -Pemphigus californicus, Davidon leaves of ash; Lachnus thujafolinus, Del Guercio, on cultivated Thujas: L. ponderosae, Williams, on Pinus ponderosa; Phyllaphis? gance, Fitch, on Quercus agrifolia, Nee; Chailophorus sp. on Quercus dinta. Nee; Enceraphis betulae, Kalt., on cultivated birches; Escallipterus arundicolens, Clarke, on leaves of bamboo; Myzocallis quereus, Kalt (?), on Quereus robur, L.; the last four are fully described; Monellia caryella, Fitch, on leaves and nuts of Juglans enlifornica, Watson; Aphis hougtonensis, Throop, on wild current; A frigidae, Oestl., on Artemisia californica; A. atriplicis, L., on Chenopodium murale and C. album; the last two are described; A bakeri, Gillette, on sunflowers, artichokes, etc.; Hyadaphis xylostei, Schrank, on Conium maculatum; Rhopalosiphum nervatum sp. n., on hazelnut; Myzus fragaefolii, Clarke, on strawberry leaves and stalks; the last two are described; Phorodon galeopsidis, Kalt., on Polygonum sp.; Amphorophora rubicola, Oestl., on thimbleberry (Rubus nutkanus); Macrosiphum ludovicianae, Oestl., on Artemisia helerophylla; M. rudbeckiae, Fitch, on the teasel.

PARKER (J. R.). The Life-history of the Sugar-beet Root Louse (Pem-phigus betae, Doane).—Jl. Econ. Entom., Concord., vii, no. 1, Feb. 1914, pp. 136-141.

Pemphigus belae is the most important pest of the sugar-beet in Montana, and each year does considerable injury, the tonnage in badly infested fields sometimes being reduced to a third. The life-cycle of the insect has been worked out and is briefly as follows. Wingless diviparous females are found upon the roots of beets, weeds and grasses all the year round; in the autumn winged individuals are produced which fly to cottonwood trees and deposit the true sexes; the sexes (226)

mate and the female deposits a single winter egg in the crevices of cottonwood bark; the following spring the young louse hatching from the egg ascends the tree and forms a gall, in which a single generation of lice is produced, all of which are winged and become the summer migrants; these migrants fly to beets, weeds and grasses and upon the leaves of these plants give birth to young which descend to the roots and start new colonies of wingless viviparous females.

M VIHESON (R.). The San José Scale in Nova Scotia. Jl. Econ. Entime Control., vii, no. 1, Feb. 1914, pp. 141-147, 1 fig.

In that part of Nova Scotia extending from Windsor to Digbs known as the "fruit belt," the San José scale (Aspidiotus perniciosis appeared for the first time in 1911. In spite of the severity of the climate compared with that of the more southern areas infested b. this insect, it has survived through two winters and in 1913 gave risto two complete generations, a third being expected. In the spring of 1913 a thorough inspection was inaugurated, the object of which was to find out the number of trees destroyed by the scale on various properties under different conditions of cultivation, size, spraying methods, etc. The details of these conditions are not cited, but tables are given which show that the number of trees destroyed in 1913 after control methods had been adopted was greatly reduced from the number destroyed in 1912, before such control had been begun. The anthor believes that it is possible to eradicate this pest, or to keep : in check so that there will be no danger of the old orchards becoming infested, provided that the regulations governing the admission of nursery stock into the province be properly enforced.

Newell (W.). A natural enemy of the Argentine Ant. -Jl. Evon Entom., Concord., vii, no. 1, Feb. 1914, p. 147.

The abundance of the Argentine Ant (Iridomyrmex humilis) in the southern part of Louisiana and Mississippi is probably due to the absence of both parasites and predaceous enemies. In September 1913 ants, identified as Eciton (Acamatus) schmitti. Emery, were found raiding the colonies of I. humilis, destroying adults and carrying of the larvae and pupae; the Ecitons appear to be very effective in their predatory work, destroying practically all the individuals of I. hands in the territory which they raid, and in some of the orange groves which were formerly threatened with complete destruction, on accounof the great abundance and activities of I. humilis, hardly a specime. of that species can be found since the visit of the Ecitons. The territory where the Ecitons have been found is on the west bank of the Mississippi, below New Orleans; this territory is almost completely surrounded by water, so that it is improbable that the Ecitons will be able to leave it; the species has probably been established there for many years past. This ant, which is the first important enemy of the Argentine ant to be discovered, belongs to the same family as that species itself

Cockerell (T. D. A.). A new Cotton Scale from Panama. -Jl. Econ. Entom., Concord., vii, no. 1, Feb. 1914, p. 148.

A new species of scale-insect, Icerya zeteki, is described from a specimen in a collection of Coccidate made in the Panama Canal Zone. The plant on which the insect was taken was undetermined.

FELT (E. P.). Acaroletes pseudococci, sp. n. Jl. Econ. Entom., Concord., vii, no. 1, Feb. 1914, pp. 148-149.

A new species of midge has been reared by Prof. Quale from Pseudocierus vitri, collected by him in Sicily, and is described under the name tenroletes pseudococci.

KING (G. B.). A new species of Kermes from Connecticut. Jl. Econ. Entom., Concord., vii, no. 1, Feb. 1914, pp. 150-151.

A new species of Kermes, K. waldeni, is described from specimens taken on oak at Portland, Connecticut.

FINE (D. E.). Ammonia Gas as a Fumigant, - II. Econ. Eutom., Concord., vii, no. 1, Feb. 1914, pp. 149-150.

Experiments have been made, and are still being carried on, to accretain the value of ammonia gas as a fumigant for stored grain. In one experiment six quart bags containing cow peas and living weevils are placed in a fumigation box of 83 cubic feet capacity; 2 oz. of concentrated ammonia were used, and as a result an average of about 76 per cent. of the weevils were killed. When 3 oz. of ammonia were used, other conditions being the same, 100 per cent. of the weevils were killed. Using 3 oz. of ammonia and 50 lb. bags of grain 75-85 per cent. of the weevils were killed. Experiments were tried with a lead lb. bag, the amount of ammonia used being increased by 1 oz. per cubic foot, but this failed to give a high mortality.

CHUITENDEN (F. H.). The Colorado Potato Beetle Migrating to the Pacific Coast. - Jl. Econ. Entom., Concord., vii, no. 1, Feb. 1914, p. 152.

Specimens of the Colorado Potato Beetle (Leptinotarsa decembinenta, Say) have been found at Colton, Washington; earlier writers stated that the Rocky Mountains afforded an impassable barrier which would prevent these insects from spreading westwards, and it is probable that this case of their occurrence in the West is due to the agency of man.

PEMES (L. M.). On a Food-Habit of Alabama argillacea.—Jl. Econ. Entom., Concord., vii, no. 1, Feb. 1914, pp. 152-153.

Moths of Alabama argillacea were reported as damaging peaches in the attumns of 1911 and 1912 in orchards at Keyser, Mineral County, W. Va. The moths punctured the skin of the ripe fruit and fed on the juice; the injured fruit would be normal in appearance until jacked when it would be found to have soft spots about an inch in hameter surrounding the punctures, rendering it unfit for packing and even for local use. Only the late varieties were injured; in these the damage was as much as 75 per cent.

Pears (L. M.). Spilogale feeding upon Peach-tree Borer pupae. Jl Econ. Entom., Concord., vii, no. 1, Feb. 1914, p. 153.

Attention has been called to the value of the common pole-cat (Spilogale interruptans) as an insect destroyer. This animal has frequently been observed removing the pupae of the peach-tree borer (Sanninoidea) from the soil; on one occasion a pole-cat was observed to go from tree to tree searching for the pupae, which it dug out and devoured.

Newell (W.). Occurrence of the Argentine Ant in Texas. II. Evon. Entom., Concord., vii, no. 1, Feb. 1914, p. 153.

On 5th January 1914 the author found a heavy infestation by Iridomyrmex homilis, Mayr, throughout the business and residential sections of Beaumont. Texas. The insect seems to have been established in this locality for the past five years. The occurrence of the ant at this point, on the main line of the Southern Pacific Railway, confirms previous observations that the most rapid dissemination of the insect takes place along the lines of heavy railway traffic.

Ritov (М.). Новыя средства борьбы съ вредителями плодовыхь садовъ. (New remedies against insect-pests of orchards.) «Прогрессивное Садоводство и Огородничество.» [Progresson Horticulture and Market-Gardening.] St. Petersburg. 18th Jan 1914, p. 13.

In a short note the author deals with a new insecticide, which soffered by the firm Aug. Linde, Moscow, under the name of "Vegetin." It is claimed that the "carbolineum quite dissolved in water," which forms part of this remedy, supplies to it all its advantageous qualities According to experiments of Russian phytopathologists, carbolineum has proved useful in a 10 per cent. solution as a remedy against canker or frost injuries, also against Lymantria dispar, Scolytidae and Coccidae when sprayed on leafless plants; but against fungus disease it has proved ineffective, and besides has caused burning. The author is of opinion that the same effects of carbolineum will appear in Vegetin besides, this insecticide, as it contains carbolic compounds, requirespecial and expensive sprayers. The price of Vegetin is about 6d per lb.

STEINBERG (P.). Вредители радиса. [Insect-pests of radish «Прогрессивное Садоводство и Огородничество.» [Progression Horticulture and Market-gardening.] St. Petersburg, 8th March 1914, pp. 239-240.

The author suggests some methods of dealing with the larvae of Agrictes segetis. Bjetk. (Elateridae). As a result of his own observations he is satisfied that the introduction of lime into the soil is a very effective remedy; also a dressing of ashes, or the use of mineral manures generally. Carbon bisulphide proves effective only in friable soil, whereas lime can be applied with success in hard (clay or peat) soils. Later tubers are cut into slices of about half inch thick, two of which are put

together, the inner side of one slice being covered with Schweinfurt green or arsenic; in order to keep the slices in position they are fastened with wooden pins (matches). These pieces are then buried to a depth of about three to four inches, after the beds are quite ready for sowing. They attract the larvae, which eat into the poisoned slices and perish.

ROLET (A.). Désinfection des sols par le sulfure de carbone. [Soil disinfection with carbon bisulphide.]—Journ. Agric. pratique, Paris, xxvii, no. 3, 15th Jan. 1914, pp. 89-91.

The use of carbon bisulphide for the disinfection of soils is being more and more widely counselled. In certain cases 176 lb. of carbon

bisulphide may be quite sufficient for an acre, but as much as 3.344 lb. has been used. One ton per acre will not injure flowers or vegetables, but expense is a consideration. Light soils are most suited for this method, as in them the fumes spread easily and rapidly, and less bisulphide is required, 1 oz. at a depth of 4 inches being sufficient for a square yard, while in a compact soil 14 oz, is necessary. In soils that are too compact or too damp, the chemical is localised too long, and may thus burn plant roots and finally disperse without reaching the noxious organisms. The holes made in such soils should be prepared for the bisulphide by a special boring nozzle fitted on the injector, more of the chemical being required the deeper the holes. The depth should be a little greater than that at which the pest is found, whenever it is possible to locate it. In light, permeable, sandy soils 193 lb. per acto has been used; in alluvial soil, 20 to 24 inches deep, 264 lb, per acre; in gravel and stony soil, 12 to 14 inches deep, an average of 193 lb. per acre. Against Phylloxera half oz. to about 2 oz. per square vard have been used; against rot (pourridié) about 7 oz. per square card, according to Dufour, and about 21 oz. according to Foëx. In Germany and Holland good results have been attained against the sematodes of the beet with 6 oz. per square yard; but in France to oz. and more have been recommended. Against white grubs 7 oz. per square yard are used. Only the cultivation of flowers and early vegetables can stand the high cost of the large doses to which practice appears to be tending. Thus, 7 to 8 oz. may be injected when dealing with mole crickets injuring cuttings of carnations in boxes. Twentyfive holes per square yard, each taking about one-third oz are required in this case, which may be considered as a maximum; for in many instances 3 to 4 oz. are sufficient. If, as is advisable, the operation is repeated at a week's or a fortnight's interval, the 8 oz. dose may be reduced to about 6 oz. On unplanted soil the application of carbon bisulphide is carried out, either in spring or in autumn, a little before sowing or planting. The soil must have settled and must not be too damp, as then the development of gas will be imperfect, or the water will wash the chemical down into the earth where it will be useless. Dry and temperate weather is the best; hot weather hastens the production of gas. When dealing with planted areas it is well to wait, if a severe frost is expected, as the evaporation of the bisulphide cools the earth. It is generally stated that sowing or planting should be done some 15 or 20 days after treatment and a little nitrate of soda added when the young growths are able to profit by it. However, tomato plants do

not appear to have suffered though planted two days after 7 oz. of bisulphide had been injected in the square yard. Care must be taken not to operate when the trees are in blossom or when the fruits are nearly ripe. E. Wolny states that the introduction of carbon bisulphide into cultivated soil has the effect of either completely or temporarily arresting vegetation and diminishing the production of vegetable matter. It is, therefore, necessary to keep it at a certain distance from the roots. It is said that both plants and pests were destroyed by an injection of 10 oz. per square yard against the nema. todes of the beet. Against this, salads are stated to have been scarcely withered at all by a dose of 3 oz., and growing carnations did not suffer from a 7 oz. to 13 oz. dose. It may be accepted that young plants are generally more sensitive. Gastine's injector (pal injecteur) is the instrument used for piercing the holes and injecting the bisulphide. One stroke of the piston rod injects about one-third fluid ounce, which is measured by the dameter of the pump chamber and the stroke of the piston. By packing in suitable disks the stroke is reduced and doses of four fifths, three-fifths and two-fifths of the above are obtainable In all cases about one-tenth of the full one-third fluid ounce remains in the chamber and this must be allowed for by adjusting the capacity to take that amount extra. When the operator is alone he withdraws the instrument and quickly closes the hole with his foot. It is, however, advisable for him to have an assistant to close the hole with a suitable instrument. For large areas a plough, such as that of Vernette of Béziers, is used. The character of the soil not only governs the quantity of bisulphide, but also the number of the holes. These may be comparatively few and far between in the case of light soils in which diffusion is easy. The converse obtains in compact soils, and double the number of holes may be necessary for the same quantity of bisulphide. In dealing with Phyllorera four holes, at a distance of about 12 inches from each other, give good results. One man operating alone is able to make 1,000 holes per day, and 3,400 holes may be made if he has an assistant. On the basis of five holes per square yard some 20,000 holes are required per acre and if a man can make about 1.360 holes per day on an average, the acre will require 14 days. Taking wages at about 3s. per day. this works out at about £2 per acre for labour. With 8 cwt. of carbon bisulphide per acre at 22s, per cwt., the cost per acre works out at about £9 per acre for bisulphide. At the present time the price of bisulphide is higher. The author mentions that for small areas, such as gardens. gelatine capsules containing 2, 3, or more grammes of the chemical may be applied. A pointed stick forms an efficient tool. The mixture of carbon bisulphide fumes with atmospheric air forms a dangerous detonating compound and workmen must not smoke. Flinty soils may cause sparks to fly when the tool is driven in, which is a source of danger. The barrels containing the bisulphide are best stored in an open field with proper protection against the sun. When drawing out some of the liquid it is well to pour in a little water, as this prevents the space left empty from filling with fumes. A greased sounding rod will serve to show how much of the liquid remains in the container, as the grease will be dissolved where wetted by the bisulphide. Empty containers must be left open for a couple of days to permit all traces of bisulphide to evaporate before the bungs are replaced.

WOLFF (M.). Der Kiefernspanner (Bupalus piniarius, L.).—Beiheft zur Zeits, für Forst- und Jagdwesen, Berlin, 1913, pp. 1-290, 7 pl. 7 figs.

The present work is a detailed monograph on Bupalus piniarius, L., the most dreaded of pine moths, written particularly from the point of view of economic forestry, with accounts of the damage it causes, and various methods adopted to combat it. The first part of the work deals entirely with the biology of the moth and contains descriptions of the various stages in its life-history, accounts of experiments and abservations made to ascertain the number of eggs laid, the period of by elopment, the proportion of males and females hatching out in liferent localities, etc., and a discussion of the nomenclature of the species. A chapter deals at some length with the geographical distrifation of the species at former times and at present, and an account serven of the conditions which now appear essential to its existence. species related to B. piniarius are referred to, but a detailed account of their life-histories and habits is being kept for a later work. An isstorical summary is given of the damage that has been reported from various localities since the first time the insect was observed in 1780 to the present day; the pathological effect upon the tree is also disussed. Parasites of the moth are mentioned, but no indication is even of their efficiency in keeping the pest under control. Various methods of combat are discussed, such as collecting the moths, trapping them by illuminants, the use of bird-lime, treating the ground in which the papae are developing with soap solution, etc.: but these are all regarded by the author as either too costly or inadequate. The welfood recommended is the raking of the ground below the trees to expose the pupae to dessication and to birds; the soil, consisting chiefly I pine-needles, must be thoroughly well turned over, either with very group rakes or by means of patent machines described and figured by "author. The book is well illustrated.

Bosskov (K. N.). Простёйшій способъ уничтоженія Озимаго Червя или Бабочекъ озимыхъ совокъ. [The simplest method for the destruction of the caterpillars or moths of Euron segetum, Schiff., and Feltin exclamationis, L.]—«Труды Бюро по Энтомологіи Ученаго Номитета Глав. Управ. З. и З.» [Memoirs of the Bureau of Entomology of the Scientific Committee of the Central Board of Land Administration and Agriculture,] St. Petersburg, x, no. 8, 1914, 11 pp.

The author starts with a short record of the outbreaks of these rests during the last few years in parts of Russia which appear to have been previously free from them. In the government of St. Petersburg there was an outbreak about 40 to 50 years ago, and then again last year (1913), when the insects invaded the neighbouring governments of Novgorod, Olonezk, and Pskov; they also devastated the crops in some parts of Siberia, where the author inspected the havoc done by them in the government of Enisseisk and in the provinces of Akmolisk and Semipalatinsk in 1911 and 1912. He then refers to the principal remedies, dividing them into (1) preventive remedies, such as landallowing the fields and doing away with all strips of waste land; (2) destructive remedies, such as catching the moths on fermen-

ting molasses and using insecticides (Schweinfurt green) against the caterpillars; and (3) protective remedies-trenches with straight walls and about 7 inches deep round the unattacked crops. To these he adds another preventive remedy which has been investigated by him in 1913 and gave better results than bare fallow; this he calls " occupied fallow" (a note announces that a special pamphlet will be published on the subject). These remedies are applied in Russia only on large estates and chiefly in the south-western governments: in all other parts of Russia they are seldom used, owing to lack of means and to the fact that it is not practicable to leave land fallow under the existing conditions of agriculture. The author has satisfied himself that these insects can be successfully controlled by the simple method of collecting the moths by hand. He observed that during the time when the moths of E. segetum and F. exclamationis were on the wing, and especially during their maximum period between the 10th and 21st July, they congregated every evening between 9.30 and 10.30 p.m. on rye plants, being almost entirely confined to the edges of the fields and principally where these adjoined fallow-land; the strip of the rye upon which the moths occurred was not broader than 31 feet. The females appear first and sit motionless, while the males arrive somewhat later and are more active; the females could be examined by the light of an acetylene lantern and even touched with the hands without any resistance on their part. Seeing that each female may lay up to 1500 eggs, the collection of the moths may have important practical results.

The author concludes by mentioning some other pests which cale also be easily collected by hand at the same time: Barathri (Mamestra) brassicae, Acronyta psi, A. rumicis, Trachea (Haderal basilinea, Euroa corticea, E. nigricans, Plusia gamma and others.

DOBRODEEV (A. I.). Дымъ вообще и табачный дымъ въ частности.

камъ средство борьбы съ яблонной медяницей. [Smoke generally and Tobacco-Smoke in particular as a remedy against Psylla mali.]

— «Труды Бюро по Энтомологіи Ученаго Номитета Глав. Управ.

3. и 3.» [Memoirs of the Bureau of Entomology of the Scientific Committee of the Central Board of Land Administration and Agriculture.] St. Petersburg, x, no. 9, 1914, 20 pp.

The author gives an account of his experiments on the fighting of Psylla mali by means of tobacco-smoke and smoke from burning straw, which were conducted in an orchard in the government of Penza. He starts with a general review of the life-history of the pst and of the remedies usually employed. Portchinsky and Gaike have both simultaneously recorded the favourable results which may be obtained by using tobacco smoke, and the author has himself shown this remedy to be very successful, both in the field and in the laboratory but the following conditions must be adhered to. The fumigating must be done at the time when the pests are on the wing, but before they have oviposited; the smoke must closely fill the whole tree for at least for one hour; the fumigating must be started along the border of the orchard, so as to prevent the escape of the insects; it must be done in calm weather, after rain, as dry air allows the smoke to rise rapidly without affecting all parts of the tree; care must be taken

there should be no branches hanging directly over the burning ied; Straw smoke proved less effective and can be recommended as a means of driving away the pests; this may be useful only meases where there are in the neighbourhood of the particular orchard some other trees (apple or Sorbus) on which the insects can oviposit, atherwise they may merely return after the fumigation is over.

The author deals also with tobacco smoke as a remedy against Psylla no and Aphids, and refers to statements of Professor Glasenapp, F. V. Theobald and others. The use of this remedy in Russia may be affected by the price of tobacco dust, which varies in different governments, depending on freight rates and other conditions. He quotes a few examples of prices, and it appears that while, for instance, the price of tobacco dust in the government of Saratov is about 71d, per 36 lb., in the government of Kaluga it is about 1s. 3d. for the same amount, and in the government of Penza about 10d. Should the price, and estocially the railway freight, be reduced, it may take a prominent part as an insecticide in Russia.

Vissilitev (I. V.) Краткія свъдънія о хлъбномъ жукъ и способы борьбы съ нимъ. [Short notes on Anisoplia austriaca, Herbst, and methods of fighting it.] «Труды Бюро по Энтомологіи Ученаго Номитета Глав. Управ. 3. и 3.» [Memoirs of the Bureau of Entomology of the Scientific Committee of the Central Board of Land Administration and Agriculture.) St. Petersburg, vii, no. 2, Second, enlarged edition, 1914, 36 pp., 20 figs., 2 col. plates.

The author begins by describing all the stages of A. austriaca, which . the most injurious representative of the genus Anisophia. This sect is found in the greater part of the southern half of the "tcherwisiom" district of Russia and a list is given of the governments in ablek it is known. Outside Russia it is found in Austria-Hungary, in 2. Balkan peninsula, in Syria and in Asia Minor. Upon the emergence of the beetles in spring their food consists at first of various grasses, such as Triticum repens and Phleum pratense, from which they pass on to rve, and after this has been harvested, to winter wheat and barley and lastly to summer wheat, on which they remain till their disapparance in the first half of August. For oviposition the insects whet soft soil, and usually keep round the borders of the field, while the central part is sometimes not affected at all. The number of eggs hid by a female is on the average 30-40, although Jaroshevsky reports that under favourable conditions a female may lay up to 48 eggs, which figure is according to the author's observations, sometimes accessed to 58. The larvae live in the soil for about 22 months, and the pupal stage lasts about three weeks. The beetle itself attacks chiefly rye, wheat and barley at the time when the grain is still soft, making the seeds and sometimes devouring them entirely. Moreover, the causes much loss by creeping over the ears and shaking out the mature grain.

The whole cycle of development of A. austriaca requires two years, the imago appearing in large numbers in alternate years; so that outbreaks, which are due to some specially favourable conditions,

recur after an even number of years.

There are three species of parasitic wasps of the family $S_{COLID-AE}$ which attack the larvae of this beetle: $Tiphia\ femorata,\ F.,\ T.\ mon_{m_1}$ F., and $Scolia\ quadripunctata,\ F.$

Tiphia femorata, of which the various stages are described, attacks exclusively the large one-year-old larvae of the Anisoplia, in search of which it penetrates into the soil. The parasite paralyses the latva with its sting, and then deposits its egg on the ventral side of the central segments of the body. This egg produces a larva in about a week, which feeds on its host externally. The development of the parasitic larva is concluded in about 11/2 weeks, when it enters the hollow skin of its victim and pupates there, passing the winter in this stage. The number of larvae infected by this parasite is not great about 6-12 per cent, according to some investigations by Portchinsky in 1879; in 1905, the author found 14 per cent, of the larvae affected in some spots, but the figure never exceeded 20 per cent. The same insect parasitises also the larvae of Amphimalus solstitudis, Polyphylla fullo, Epicometis hirtella and insects of the genus Aphodius. The habits of Tiphia morio, which parasitises A. austriaca and Amphe mullus solstitudis, are similar to that of T. femorata. According to Wiedhalm T. morio produces two generations during one summer while Rossikov is of opinion that the same may be the case also with T. femorata.

Scolia quadriponetata has been recorded by Portchinsky as a parasito of A. austriaea, and also parasitises Oxythyrea stictica, but its biology has not yet been investigated. Apart from the above parasites, the larvae of A. austriaea are also attacked by the larvae of Microphthological disjoineta, Wied., a Tachinid fly of the subfamily Dexinae, which destroy chiefly the larvae of Melolontha happocustani, Amphimales solstitialis and Polyphylla fallo. A description is given of the various stages of this fly, which has two generations in South Russia, the second one hibernating in its larval stage inside the body of the host. According to Krassiltchik this parasite develops very rapidly and devours the host in a few days.

The larvae of A. austriaca are subject to the attacks of a nematode worm, Leptodera dentata, and also become infected with flacherie and a fungus disease due to Entomophthora unisophiae. In 1902, near Kishinev, this disease caused the death of 60-70 per cent, of the larvae of A. austriaca.

The author proceeds to deal with control measures against Anisophial describing first the digging operations which must be conducted in order to estimate the intensity of infestation. These must be carried out during the second half of the summer, after the harvest, till late in autumn, when the frosts begin. The digging ought to be done in plots which were occupied during the summer by grain crops, especially by wheat and rye; also in fields left fallow during the previous season, which have been ploughed up for crops other than grain; and neighbouring meadows and other soft soil should also be investigated. The operations can be limited to a strip of some 25–35 yards round the fields, the procedure being to dig holes of a standard size in various spots and then to estimate the total number of larvae in the contained soil, as well as the numbers of those that are diseased, or suffering from parasites, etc. The results obtained by these investigations ought to be checked by renewed investigations in the following spring.

a order to find out the progress of diseases, etc., during the winter. Should these investigations prove that an outbreak may be expected, the preventive measures recommended are, to decrease the area of cops, such as wheat, barley, and especially summer wheat, and to harvest the grain as early as possible. As the insects attack principally the edges of a crop, it is suggested that the fields be made square, rather than long parallelograms, in order to reduce the length of the margin to a minimum.

The following destructive remedies are suggested:—Trap crops of about and rye, and also maize, the soil under which is preferred by the posts for oviposition. These fields must be sown before the outbreak has really started, and the beetles which concentrate on them have be collected by hand, while the eggs can be destroyed later by reploughing. Reploughing is also recommended for the destruction of paper, in spots where investigations have shown the presence of large numbers of larvae. As pupation takes place after May, the ploughing must not be done before the middle of that month, but it must be finished by the first half of June. The insects may also be account to one side of the field by drawing heavy ropes across it, and they want to be collected into sacks and destroyed. This must be done at the hottest time of the day, when the beetles are more easily driven town the wind: if there is no wind or if the wind is too strong, this can be becomes impracticable.

In South and Middle Russia there are additional species of Anisoplia, such as A. cyathigera, Scop., A. segetum, Herbst, and others which are less injurious. A. cyathigera occurs over a larger area than I austriaea, being found as far north as the government of Tuha and Kazan; while A. segetum ranges from the government of Kurland in the west to the government of Simbirsk in the cast. They usually appear earlier than A. austriaea. A. cyathigera injures grain in the same ranger as the latter species, and as its habits are similar, the remedies resummended may prove effective against this pest as well. The coarge done by A. segetum is not very serious, consisting chiefly in the field sometimes even before the end of July.

A synoptical table to facilitate the identification of the various species of Anisoplia, another giving the distinctive characters of the commoner Lamellicorn larvae found in the soil, and two coloured tites, are appended.

Removich (A.). Простое средство противъ ленки. [A simple remedy against Epicometis hirtella, L.]— « Прогрессивное Садоводство и Огородничество.» [Progressive Horticulture and Market-Gardening.] St. Petersburg, no. 5, 15th Feb. 1914, pp. 137-138.

The author gives an account of a remedy against Epicometis hirtella, 1. (Tropinota hirta, Poda) which he has successfully applied during the last 8-10 years and by means of which he has been able to keep the asset entirely under control. The remedy consists in spraying lilac bashes, which are found in nearly every garden and which blossom at a later date than fruit trees. The insects, after the blossoming of the apple trees is over, pass on to the lilac, on which they feed very freely, and by spraying these bushes at the time of their blossoming

with Paris green or Djipsin of a double strength it is possible to destroy practically all of them, except those which arrive later from noigh bouring gardens where no remedies are used, or from the open fields.

VASSILIEV (Eng. M). Дополненіе (I-oe) къ .. Списку животныхь вредителей люцерны." [First supplement to "The List of Animal Pests of Lucerne."] «Хозяйство» [Agriculture], Kier. по. 6, 26th Feb. 1914, pp. 189-193. (From the Myco-Entomological Experimental Station of the All-Russian Society of Sugar-Reinners in Smiela, Goyt, of Kiev.)

For the original list, to which this is supplement, see this RecondSer. A. i. p. 526. The following species are now added.

COLEOPTERA: The sprouts of lucerne are injured by larvae of Leptosonyx typhoides, Dalm., a Chrysomelid. An outbreak occurred in the government of Astrachan in 1912, where the larvae also damaged vetches, lentils and wild steppe plants. The insect is known only from South Russia and has been very little studied. Plagional as (Clutus) floralis, Pall., this Longicorn has been recorded by Paczoski as a pest of lucerne in some parts of the government of Taurida, Hypera (Phytonomus) denominanda, Cap., although known in Austria-Hungary, Germany, Turkey and Caucasia, is not reported as injurious. but according to Demokidov it injures the leaves of lucerne in Turkestan (1906). The following information is supplied by this author: the weevils winter on the surface of the earth among the upper roots of lucerne or under dry grass; early in spring they feed on the leaves and oviposit on the plant; the larva gnaws long holes in the leaves and after 3 4 weeks pupates on a folded leaf in a white transpared: cocoon; in about 4-5 days the beetle emerges, and lives for some time on the lucerne before hibernating. Calosoma and its larvae and some parasites are mentioned as enemies of this pest. The following remedies are suggested: spraying in spring with Schweinfurt green (4.8 - 6 drams of green and double this amount of freshly slacked line in about 2.7 gallons of water), or with barium chloride (4.5-7 oz. in 2.7 gallons of water); dusting with a powder of freshly slacked lime (after rain or dew) by means of "Torpille" bellows; and the early cutting of lucerne as a means of destroying the larvae as well as the

HOMOPTERA: Acocephalus rusticus, F., is reported by Paczoski to have injured lucerne in the government of Cherson in 1913.

LEPIDOTERA: -Chloridea obsoleta, F., was reported in 1911 from Turkestan, where its caterpillars injured the leaves of lucerne, cotton seeds, maize, and tomatoes. Laphygma exigua, Hb., also reported in 1911 as attacking lucerne in Turkestan. In the same year the caterpillars of this pest appeared in the government of Astrachan on lucerne, but they were not noticed again in 1912. Eubolia arenacearia, Hb., also reported in 1911 as attacking lucerne in Turkestan. In the same year the caterpillars of this pest appeared in the government of Astrachan on lucerne, but they were not noticed again in 1912. DIPTERA: Perrisia onobruchidis, Bremi; the author refers to

DIFTERA: Perrisia onobruchidis, Bremi; the author refers to Prof. Kirchner, who mentions this Cecidomyid amongst the pests of lucerne in the first edition of his book, although it is omitted in the

exceed. According to Keppen, this pest was reported from the government of Charkov in 1882 on sainfoin crops, having been identified by Portchinsky; besides sainfoin, the larvae attacked lucerne Misterago falcuta), Melilotus officinalis, Desr., M. macrorrhizus, Pers., e. [M. allots, L.

Scherbakov (Th.). О паразитахъ-яйцевдахъ плодоморки и о работахъ надъ ними А. Радецкаго. [On the parasites of the eggs of Cydia pomonella and the investigation of them by A. Radetzky.]—Reprint from Записки Симферопольскаго Отдъла Императ. Росс. Общ. Садоводства. [Memoirs of the Simferopol Branch of the Imperial Russian Society of Horticulture]. Simferopol, no. 140, 1914, 12 pp.

The author refers to the papers by A. Radetzky on his importation of the parasites of the eggs of Cydia (Carpocapsa) pomonella from Astrachan to Turkestan, and points out that at the First Russian Conference of Entomologists in Kiev, in August of last year (1913), the work of Radetzky was severely criticised. The latter stated that bad imported into Turkestan the parasite known as Trichogramma (haphthora, Pentathron) semblidis, Auriv., but owing to some doubts s to the exact identification of the parasites found in that country, he gave to it the name of Trichogramma (Pentarthron) carpocapsae, When he sent his specimens to Russia, the Russian entomolegists were not able to discover amongst them either of these two steeles, but identified them as Trichogramma fasciatum, Perkins. thus the exact name of the parasite and the number of species imported or Radetzky is not known, though this is a matter of great importance, se far as their usefulness, etc., is concerned. The author further loabts the statement of Radetzky that there are no local species causitic on C. pomonella in Turkestan, for a species has been found Plotnikov in Fergana, where no parasites have been imported; or does he accept the contention that C. pomonella was absent from Takestan till it was imported by the Russians after the conquest.

Funov (A.). Отчетъ о дъятельности Налужскаго Энтомологическаго Бюро за 1913 годъ. [Report on the work of the Entomological Bureau of the Zemstvo of Kaluga for the year 1913], Kalaga, 1913, 36 pp.

The Entomological Bureau in Kaluga came into existence at the terming of last summer and this is a report on the first half-year's work. Attention has principally been paid to pests of orchards, as these constitute an important industry in the government, covering early 16,200 acres. Most of these orchards are in a very unsatisfactory state, and the Bureau had to undertake the task of teaching the population the necessity for proper cultural methods, as well as measures for controlling the various insect pests, which have yearly levied a leavy toll. The report goes on to describe the campaign conducted its staff on two areas, one in the district of Mestchovsk and the sher in the district of Kozelsk.

Aporia crataegi, L. The larvae of this butterfly started emerging from their winter nests in the first half of April and attacked the young fields. The destruction of the nests, cleansing of the stems and the

application of tanglefoot belts were immediately initiated; belts were put on 7,000 trees in one district and on 3,500 trees in the other Before the blossoming of the trees spraying was proceeded with and a total of 24,300 acres in both localities was sprayed with Paris green, After the 21st May the first pupae appeared, which gave a new generation from the 2nd June, but the number of butterflies on the wing was not great. The first eggs were found on the 17th June, the caterpillars emerged after the 6th July, while after the 25th August the first winter nests were noticed. The results of the campaign are considered satisfactory and only those orchards suffered great damage the proprietors of which applied no remedies, these being stripped quite barrolleaves. In all the other orchards the harvest was small, and some times bad, but the trees produced leaves.

Psylla mali, Först. The hatching of the larvae started on the 19th April and on the 23rd they were already inside the buds, which later on were entirely covered with the pests. The images appeared on the 23rd May, and large numbers of eggs could be found at the end of August. The usual remedy of spraying with quassia and greet soap was applied, but owing to the large area to be treated this reme in could not be completed in time, i.e., before the larvae entered the buds. If applied in time it gave excellent results. The spraying with insecticides in old orchards was rendered ineffective owing to the close planting of the trees, coupled with their thick crowns. Find gating with tobacco was also applied during the time when the insecwere on the wing for two to three months from the end of Marwhich always gave excellent results. The only drawback to the remedy is that it destroys the pests after they have already caused much damage in their larval stage, but it frees the orchards from them for the next year.

Aphis point, de G., was found in young orchards (5-8 years off and in nurseries. Spraying with quassia was very effective. The hatching of the lice started on the 21st April; the first hymph, were noticed about a forthight afterwards; the first winged specimens appeared on the 17th May; in the first half of September plenty of eggs were found. Aphis sorbi Kalt, was found in both localities.

Anthonomus pomorum, L., was found in orchards everywherebut owing to the feelble blossoning of the trees its injurious actions was not great. The hibernating weevils appeared after the 11th April: larvae were found in the buds after the 12th May they pupated from the 26th May and produced imagines from the 17th June. A table showing the results of shaking the insects from the trees is given, from which it appears that 211 beetles were obtained in this way free: 33 apple trees; on the same trees 73 beetles were collected on the sticky belts. Spraying with lime in the orchards, where the short spring allowed of this remedy, proved successful.

Cydia pomonella, L., was observed in every bearing orchard. The caterpillars of Malacosoma neustria, L., appeared only in small numbers and no special remedies were applied. Nests of Hyponomenta malinibus. Z., to the number of from 2 to 5 were noticed on trees from the first half of June to the beginning of July. The insects were found everywhere, but not in great numbers. Euproctis chrysorthoet was seldom found.

The report further refers to the spraying of the trees with sulphate of tren, which had for its object the removal of the moss, lichen, etc., and gives a general review of the results of the campaign. The pests mentioned above were found also in other parts of the government cutside the two districts specially dealt with. From the town of Kaluga Byturus tomentosus, F., and Cossus cossus, L., were reported. The caterpillars of the latter were found in poplar trees between the 19th August and the 19th September; the first pupation took place on the 23rd August.

As to the pests of field crops, chief amongst them were Agriotes limentus, L., and Euxoa segetum, Schiff. The larvae of A. lineatus caused great injury to some fields in the district of Kozelsk, during the autumn of 1912. Investigation conducted on the same fields in April 1913 again showed their presence. In order to ascertain the degree of the infestation samples of the soil were taken out and carefully examined by screening, the soil having previously being made friable; for each sample a clod of earth about 11 feet square and about 101 inches thick was dug out from each dessiatine (2.7 acres); these samples showed an average presence of 20,000 larvae per acre. Two kinds of remedies were tried; potato baits poisoned with Schweinfurt green, and suffocating with carbon bisulphide ((S2). The first experiment was conducted in the following way: slices of potatoes were put into a solution of 1 per cent. Schweinfurt green in sal ammoniac and left there for about 24 hours; the potatoes were then left in the open air till the smell of ammonia was lost, after which they were set m trap holes of about 8 inches square and 9 inches deep, which were covered with boards. Such holes were dug at a distance of 20 paces one from another round the attacked spots. Only a few specimens of dead larvae were discovered later in these traps, but in the soil cound them more larvae, motionless, and of a peculiar blueish brown colour were found; of 48 such larvae which were put into a glass with earth and food, 32 perished in about 10 days, i.e. 661 per cent. Evidently the larvae had left the holes after having eaten the poisoned baits. Details are given of an experiment with carbon bisulphide; but the percentage of larvae killed was only 32 I per cent. and 38 3 per cent. Owing to the cost of this remedy it is not considered possible to increase the amount of CS, but evidently the time during which remained in the earth was not sufficient to permit of complete diffusion in that particular soil.

Apart of one field manured with superphosphate was injured, while a seighbouring part manured with basic slag was not attacked by the tests. According to the proprietor of the field, the larvae last year also attacked a part manured with basic slag, when the latter was scattered about the field; while this year the method of manuring was to lay the slag in regular lines. As a rule, crops manured during the summer with dung were able to withstand the attacks of the aireworms, although there were large larvae in the earth of such fields; widently the dung caused a strong and rapid growth of the plants It is also reported that on one field, part of which was sown with grain tree disinfected with formalin, owing to its suffering from a fungus disease (Tilletia secalis, Kuhn), the crop was very heavy; while on the other part, where no such process was applied to the sown grain

the plants were injured by the larvae. The author is not inclinate, explain this as due to the influence of the formalin alone.

Experiments conducted in the laboratory on the food of the laboratory showed that they preferred cucumbers, beetroots and carrots to the next place being taken by potatoes, while they are turnips of unwillingly and did not touch radish. Cannibalism was also observed

Euroa segetum was present in the government, but not to a serious extent. The following species are also recorded: Feltia (Aquas, exclamationis, L., Ochsenheimeria taurella, Schiff., an unidentifies species of Thrips, Siphonophora verealis, Kalt., Phyllotreta variable Redt., and Athons niger, L.

Dinton (P.). Нъ борьбъ съ капустной мухой. [On the fight against Chortophila (Anthomyia) brassicae.] - « Садоводъ» [The Hadron turist], Rostor-on-Don, no. 2, Feb. 1914, pp. 111-113, 2 figs.

The author gives some information as to the life-history of the fly. The larvae attack the young stalk and collar of cabbages, causa, the plants to fall over. The imago appears early in spring at ; oviposits on the stalks of the plants, near the earth, the eggs hatching, about ten days. The larvae pupate in the earth and produce a series generation in June July. The duration of the whole development of the insect is about 11/2 months, so that they can produce two to three generations during one summer. The females prefer to oviposit ω dung, so that plants manured with pondrette or fresh dung or similar manure are more liable to attack, while the damage done by the postis less in fields manured with compost or some other artificial manure The most radical remedy is to take out the injured plants and to destroy them, together with the larvae, by burning. As a preventive measure the author suggests spraying the plants with milk of lea-(1.2 lb. lime in about 2.7 gallons of water), but this remedy is effective only for a short time. Good results can also be obtained by rubbing the collar of the plants between the fingers, which operation preventthe hatching out of the larvae, this must be repeated every ten days and at the same time the earth round the plants must be sprayed with milk of lime or simply with dry lime (about 1 cwt. to the acre). The author records the results of the following method applied to two ic'dof cabbage during last year. Both fields were manured only with mineral manure, such as basic slag, potash, etc., besides having belimed in the previous autumn. The first field was also twice reploughes during the autumn and twice harrowed in the following spring. The second field was only once reploughed in autumn. The rubbing the stalks was only once undertaken and no liming was applied after wards. The results were that on the first field only 5-8 per cent. the plants fell out, whilst on the second one this figure reached 20 per cent.

Steherbakov (Th.). Замътки по фаунъ уховертокъ, трипсовъ м сътчатокрылыхъ Россійской Имперіи. [Notes on the Deraptera, Thysanoptera and Neuroptera of the Russian Empire.]-Revue Russe d'Entomologie, St. Petersburg, xiii, no. 3-4, 1913 pp. 461-466.

The following species of Thysanoptera are recorded by the author

Hydritherips aculeatus, F., Aeolotherips fasciatus, L., and Limothrips betweenis, Hal., found in 1912 on tobacco leaves in the government of felicinigov by Miss A. Bragin. The author is of opinion that both were swept by the wind on to the tobacco and perished on the Figs surface of the latter: he does not consider it in any way probable at they feed on tobacco. Scolothrips sexmaculatus, Pergande, found F Zaitzev near Tiflis in 1912. This is the first time that this species has been reported in Russia, as up till now it has been known hy from the United States, according to Moulton and Qualey; it probable that it has been imported into Russia from the cotton Santations of North America. Physothrips atrabas, Hal., and Frank-4th tennicornis, Uz., found on tobacco in the government of Tehernigov in 1912 by Miss A. Bragin. Drepanothrips viticola, Mokrz., long by Mokrzecki in 1901 near Novorossiisk, is injurious to vines, ansing red spots to appear on them. The females winter underneath to bark and appear on the leaves in April. Heliothrips haemo-Loddis, Bouché found by Mokrzecki in 1912 on leaves of Vibur-. ... sp. in Suchum, in the garden of the Experimental Station.

Pospletov (W.). Versuche künstlicher Infizierung der Wintersaateule (Agastis segetum, Schiff.) mit parasitischen Hymenopteren. [Experiments on the artificial infection of Agrotis segetum, Schiff., with sarasitic Hymenoptera.] "Zeits. wissen. Insektenhiol., Berlin, x, ao. 2, 15th Feb. 1914, pp. 52-58.

This is practically a translation of the paper abstracted in this grown Ser. A. i. p. 539.

FRIEDERICHS (K.). Ueber Adoretus vestitus Boh. als Schädling in Samoa und seine früheren Stände. [Adoretus vestitus, Boh., as a pest in Samoa, and its previous significance.] Zeits, wissen, Liecktenbiol., Berlin, x, no. 2, 15th Feb. 1914, pp. 41-47, 6 figs.

This Adocetus has been known for some time past in Samoa as the 3 so Beetle, from its principal food-plant. Until recently it has not on regarded as a pest, but now it has taken to feeding on cacao, and * depredations may probably become serious. The author believes the bealso the cause of damage observed on Liberian coffee; species of The same genus are recognised pests of coffee and cacao in Java. The rolle hides during the day, and feeds at night, being attracted by the lt occurs all the year round. Little is known of its life-history, wit is surmised that breeding takes place at all times of the year, we larvae are always to be found among the roots of grasses or "or plants; these larvae are not known to do any damage. It and that the cacao trees most liable to be attacked are those which * approtected by larger trees, and which stand more or less alone. behaving the beetle is a matter of some difficulty, mechanical and cancel methods which have been tried having proved of little use; the case of spraying (nature of spray not stated), the beetle was stowed but the leaves of the plant were badly damaged. No and enemies which would keep the beetle quite under control are Than in the vicinity where the damage is done, but the author that, were they introduced, the enemies which he has advoevel for use against the rhinoceros beetle (Orycles rhinoceros, L.) 121, E2

would prove efficient. [See this *Review*, Ser. A, ii, p. 26.] As regards fungus diseases, infections with green muscardine have so far not been successful. A description of the species is given.

CHADWICK (C. J.). White Ants on Coconuts.—Trop. Agric., Penal, miga, xiii, no. 2. Feb. 1914, p. 96.

The author in reply to Mr. Krishnaswami Row, regarding the ravages caused by white ants in a young coconut plantation, suggests the use of a mixture of 1 lb, crude perchloride of mercury and 10 gallous of water, the soil surrounding the young palms to be saturated with this solution. This works satisfactorily in the case of a rubber plantation. It has been found that the best situation for a coconut plantation is near the sea or along the banks of a river where the soil is well drained and supplied with moisture throughout the year. According to Mr. W. W. Froggat a few pounds of kainit dug in about the roots of fruit trees will drive away white ants. [See this Review, Ser. A. i. p. 513.]

MARTELLI (G.) Il Tetrangchus telarius, L., provoca agli Agrumi la cosi detta Ruggia rossa. [Tetrangchus telarius, L., the cause of the so-called red rust on citrus trees.]—Giorn. Agric. Merid., Messing. vii, nos. 1-2, Jan.-Feb. 1914, pp. 7-10.

Many lime trees were almost completely defoliated in parts of the provinces of Messina and Catania during June and July, 1912. The upper aide of the leaves showed yellow patches and the corresponding places on the under side were reddish. The fruit was spotted with brownish red. Among the growers this was known as red rust. The author states, as the result of careful experiments, that the injured leaves and fruit harbour *Tetrangelias telavius*, L., and this nite is responsible for the discoloration.

MARCELLI (G.). Sulla Bianca-rossa. [Concerning Chrysomphalus.] Giorn. Agric. Merid., Messina, vii, nos. 1-2, Jan.-Feb. 1914. pp. 28-29.

In a reply to a correspondent the following data are given: (1) Six hundred large lime trees infested with Chrysomphalus require 70 pints of concentrated polysulphide (density 25° B.) 5 per cent, solution per tree per application, or 2.100 pints of concentrated polysulphide weighing 2.860 lb.; as three applications are necessary, the total weight would be 8.580 lb. (2) The number of applications may be reduced to two, with a corresponding reduction in the amount of insecticide, but in that case an operator must spray the top of the tree from a high ladder. (3) A single application of 20 per cent, solution in winter is not sufficient; two applications are required and they must be carried out as stated. Furthermore, the neighbouring plantations must be either clean or under similar control measures. The effects of the treatment will last for two years, if not longer, and no spraying will be required during that period.

GREEN (E. E.). On some Coccid pests from the Seychelles,—Jl. Econ. Biol., London, ix, no. 1, March 1914, pp. 47-48.

A small collection of insect pests, received from Mr. R. Dupont, squrintendent of Botanic Gardens, Seychelles, contained the following species of Coccidate: Aspidiotus ficus. Ashm., taken on leaves of Inneiu sp., an ornamental Cycad cultivated in tropical gardens; I broneliue, Newst., on leaves of the Pineapple, a serious pest, probably imported from the Canary Islands; Coccus (Lecanium) hesperium. Auct., and Eucalymnatus (L.) tessellatus, Sign., on leaves of the Water Hyacinth; these insects may be regarded as beneficial, since the excessive growth of this plant blocks the waterways; Saisseliu L.1 hemisphaerica, Targ., on leaves of Justicia gendariussa, an anamental plant which seems particularly liable to Coccid infestation.

PICURD (F.). Les champignons parasites des insectes et leur utilisation agricole. [Fungi parasitic on insects, and their utilisation in agriculture.]—Ann. Ecole Nat. d'Agric., Montpellier, xiii, no. 2-3, 1914, pp. 121-248, 28 figs.

The present paper is a comprehensive account of the different species of fingi which are parasitic on insects; the author merely refers to those which live on insects either symbiotically or which only cause sight harm to them, and confines his descriptions to the species which are really detrimental to the host, and which may possibly be of use agriculture in combating insect pests. The descriptions are written more from the point of view of the zoologist and agriculturist than from that of the mycologist. The species of fungi dealt with are arranged according to their systematic order. In the group of themycotes, the family Entonopuritoritate is the only one containing species harmful to insects, notably the genus Empissa. Of the isomycetes the following groups are described: Laboulbeniaceae, spheriaceae, Nectriaceae, and Perisporiaceae; a large section of the samy species that kill insects.

Harmful parasitic fungi react on their hosts in various ways; in the case of the Laboulbeniaceae, the fungus gets its nourishment tion the tegument of the host, without seriously damaging the body or injecting the toxic substances into the system of the host. Others, more harmful, pierce the chitin and destroy the layers of adipose issue lying below. Still more harmful are those whose mycelium branches in the body of the host, filling up the tracheae and causing enflocation, as does Fusarium in the case of certain Acaridae. The ESTOMOPHTHORIDAE and VERTICILLIACEAE kill their hosts by sending out filaments which penetrate all the tissues, destroying these and replacing them with a secretion, so that the insect becomes mummified: miscardine diseases work in this way. Sometimes the body of the and is entirely disintegrated, as is the case with Coccids parasitised w the Ascomycete Myriangium duriei. The modes of infection and the degrees of virulence of the diseases are discussed at some length, and a comprehensive bibliography is given.

A section of the paper deals with the economic significance of fungikillers of insects. The accounts of experiments given show that attempts to combat pests by the introduction of fungus diseases have so far not been very successful; and the author appears to think that while these diseases can be artificially increased where they already exist, yet it is not likely that they can be established in places where they do not occur naturally.

Nor. (P.) Les Insects et les Acariens nuisibles aux plantes cultivées en France. [Insects and mites harmful to cultivated plants in France.]—Bull. Trim. Lab. Rég. d'Entom. Agric. Seine-Infer., Rouen, Jan.-March. 1914, pp. 3-11.

The writer gives tables showing the particular orders of insects and the number of species attacking each of the 286 cultivated plants of France. The 16 cultivated fruit trees are attacked by 1,671 different kinds of insects; 28 market garden plants by 704 species; 31 forage plants and cereals by 988 species, and so forth.

NOEL (P.). Les Ennemis des Salsifs. [Enemies of salsify.]--Bull, Trim. Lab. Rég. d'Entom. Agric., Seine-Infér., Rouen, Jan.-March, 1914, pp. 11-12.

The following insects are given as the chief pests of salsify: Cassida thoracica, Klug; Aphis papaveris, F., which sucks the juice of the leaves in June; Aulax scorzonerae, Giraud; Scotogramma trifolii, Rott. (Mamestra chenopodii, Schiff.), the caterpillars of which destroy the leaves from July to October; and a Cecidomyid.

AULMANN (G.). Ein neuer Schädling an Kokospalmen auf Samoa. [A new pest of coconut palms in Samoa.] -Entom. Rundschau. Berlin, xxxi, no. 5, 14th March 1914, pp. 31-32, 3 figs.

A new Hispid beetle is described under the name of Promeedheed lindingeri, Aulm., as a pest of coconut palms in Samoa. The eggs are deposited on the under side of the leaf, and the larvae make long mines in the parenchyma, causing the leaf to die. The damage done by the imago is quite different; it settles on the upper surface of the leaf and eats away the tissues from the outside in parallel lines, which also kills the leaf.

Lyle (G. T.) Contributions to our knowledge of the British Bratonides.
No. 1. Meteoridae.—Entomologist, London, xlvii, Mar. 1914.
pp. 73-77, 1 pl.

During the past ten years the author has given considerable attention to the study of hymenopterous parasites, their breeding habits and life-histories. The present paper, which is the first of a series describing the results of this work, deals with the British species of the Meteories of the Meteories of the Sitish species of this family are all referable to the genus Meteories, of which six species are described. M. albiditarsis was bred from a larva of Taeniocampa miniosa, and also from larvae of T. gracilis. T. patrerulenta. T. stabilis, and Panolis piniped. M. chriscophthalmus was bred from larvae of Geometratian. M. altricom was bred from larvae of Tortrices, taken from oak trees. M. altricom was captured, together with specimens of the hyperparasite Hemilios areator, running about on furniture which was infested with the moth Tinea biselliella, evidently searching for the lepidopteron.

THEOBALD (F. V.). Additions to the list of Kent Aphididae.—Entomologist, London, xlvii, Mar. 1914, pp. 100-104.

A list is given of Aphides not previously recorded for Kent, including a few new to British fauna; the list includes 12 genera and about a species. The most abundant and harmful species in 1913 was Aphics sorbi, which did great damage to the apple crop; next in importance was A. abietina, on spruces, causing in many cases complete defoliation.

FELT (E. P.). Diadiplosis coccidivora, sp. n.. Entomologist, London, xlvii, Mar. 1914, pp. 86.

A description is given of a new species of midge, Diadiphosis cocciderate, reared in some numbers from a species of Pseudocuccus by A limberford in Ceylon. It appears to be related to D. cocci which pass upon the eggs of the black scale, Saisselia nigra, though differences may be great enough to warrant placing it in a separate genus.

HOWLETT (F. M.). A trap for Thrips.—Jl. Econ. Biol., London, ix, no. 1, Mar. 1914, pp. 21-23.

The author gives the results of experiments made to test the degree of attraction of certain chemical substances for flower-haunting insects. Three of the substances tried were found to have a marked attraction for Thrips, namely benzaldehyde, cinnamylaldehyde, and anisaldehyde. The two latter can be bought for 8s. 40s. per lb., but benzaldehyde busts under 2s. per lb.; taking the same quantities as were used in the experiments. I lb. is enough for about 200 traps, which retain their officiency for at least a week. To prevent possible oxidation of the aldehyde, a trace of formaldehyde may be added. In the experiment traps two species of Thrips were caught, but neither was identified. The method adopted was to expose small bowls, each containing about half a pint of water with 2 c.e. of the aldehyde stirred up in it. The insects attracted are drowned in the water. The experiments were made in November and December, a season when Thrips is far from abundant, and consequently the figures showing the numbers caught are small. The author believes that in warmer weather the catches would be larger. He proposes to continue the experiments m warm weather and to use nitrobenzene, a substance which does contain the aldehyde group, but which has a smell closely resembling that of benzaldehyde. It should then be possible not only to abtain more evidence as to the practical economic value of the method, but to ascertain also whether the attractiveness is due to the presence of the aldehyde group, or whether the insect's olfactory sense is, like our own, similarly affected by nitrobenzene and benzaldehyde.

HOOD (J. D.). On the proper Generic Names for certain Thysanoptera of Economic Importance. - Proc. Entom. Soc., Washington, xvi, no. 1, March 1914, pp. 34-44.

The author contends that the tobacco thrips, the pear thrips and the orange thrips—species responsible in the United States for damage amounting to many thousands of dollars every year, are at present arongly placed in the genus Euthrips, Targ., and should be known as Frankliniella fusca, Hinds, Taeniothrips pyri, Dan., and Scirtothrips

citri, Moulton, respectively. The purpose of the present paper is to correct the generic positions of these and allied species. The account is divided into three parts: first, a brief general discussion of the nomenclature of the several groups of species which have been included in the genus Euthrips; second, a catalogue of the American components of the genera to which these species belong; and thind, bibliography of all papers necessary to a proper study of these questions.

WALTON (W. R.) A New Tachinid Parasite of Diabrotica villability. Proc. Entom. Soc., Washington, xvi, no. 1, March 1914, pp. 11-11, 1 pl.

In 1871 Shimer described a Tachinid parasite of *Diabrotica cituta*, the cucumber beetle, under the name of *Celatoria (Melanosphora) diabroticae*. The author gives in the present paper an account of a second Tachinid parasite of this beetle, which he described as *Neocelatoria ferox* (gen. et sp. nov.).

COAD (B. R.) & PIERCE (W. D.). Studies of the Arizona Thurberia Weevil on Cotton in Texas. Proc. Entom. Soc., Washington, xvi. no. 1, March 1914, pp. 23-27.

In order to establish the taxonomic status of the weevil breeding in Arizona wild cotton (Thurberia thespesioides) the authors undertook a number of studies, the results of which are given in the present paper. This weevil very closely resembles the Mexican cotton boll weevil (Anthonomis grandis), and an account of it has already been given, under the name of A. grandis var. tharberiae [see this Review Ser. A. ii, pp. 78-79]. Experiments were made, the principal result-of which were to show that the two varieties are able to interbreed and produce fertile offspring. The question whether the thurberiae form will flourish on cultivated cotton is now being tested.

PIERCE (W. D.) & MORRILL (A. W.). Notes on the Entomology of the Arizona Wild Cotton,—Proc. Entom. Soc., Washington, xvi, no. 1. Mar. 1914, pp. 14-23.

The Arizona Wild Cotton plant assumed economic importance on being found in 1913 to harbour a variety of the dreaded Mexical cotton boll weevil (Anthonomus grandis, var. thurberiae Pierce). The authors have since made a thorough examination of the insects associated with this plant.

The plant is a perennial, resembling the cotton plant so closely that it is locally known as wild cotton: it occurs at altitudes of 2,300-5,000 feet in Arizona. The species of insects recorded from the plant are 83 in number distributed as follows: Acarina 1, Rhynchota 14. Orthoptera 3, Thysanoptera 2, Lepidoptera 7, Coleoptera 24, Hymenoptera 29, Diptera 2, and Strepsiptera 1: according to their behaviour towards the plant these insects may be classified as injurious 25 nectar-visiting 40, parasitic 12, and predaceous 6. The most important injurious insects are the boll-weevil (Anthonomus grand's therberiae), the cotton worm (Alabama argillacea), the Thurberia boll worm (Sacadodes pyralis, Dyar), a blister mite (Eriophyes sp.), a gall-forming insect belonging to the family Cecidomyhidae, and a mealy bug (Pseudococcus sp.).

An Act to prevent the Introduction into British India of any Insect, Fungus or other Pest, which is or may be destructive to Crops.

An Act entitled "The Destructive Insects and Pests Act, 1914," which received the assent of the Governor-General of India on the 3rd February 1914, empowers the Governor-General in Council to prohibit or regulate, by notification in the Gazette of India, the import into Bruish India of any article or class of articles likely to cause infection to any crop. Customs Officers are authorized to deal with any such prohibited articles as though they had been restricted or prohibited under the Sea Customs' Act. The Local Government is empowered, subject to the control of the Governor-General in Council, to make rules for the detention, inspection, disinfection or destruction of any such articles or of any article that may have been in contact or proximaty thereto. Fines up 1000 rupees may be inflicted for a breach of such rules.

A New Regulation prohibiting the Importation of Potatoes into Canada.

The following Order-in-Council was passed on the 7th March 1914, amending the regulations under The Destructive Insect and Pest Act of the Dominion of Canada, in order to prohibit the importation of relators from California:—

The Regulations under 'The Destructive Insect and Pest Act,' established by Order-in-Council, dated 11th May, 1910, are amended by adding to Section 12 thereof, which contains a list of destructive meets, pests and diseases to which the said Act shall apply, the following insect pest—'the Potato Tuber Moth (Phihorinaea operculella, Jell.)'; and by adding to Section 13, after the word 'Miquelon' in the second line thereof, the following words, 'also the State of California, being one of the United States of America.'"

A Notice restricting the Importation of Coffee Plants or Coffee into the Uganda Protectorate.—Uganda Official Gazette, 28th Feb. 1914.

This notice prohibits the importation of coffee plants (whether living or dead) and coffee, other than roasted beans and ground coffee, into the Protectorate except under a written permit previously obtained from the Director of Agriculture. This prohibition does not apply to roperly packed and sealed packages of plants or coffee passed in transit through the Protectorate. But if such a package is opened in transit or is so damaged that its contents may escape, the package and its contents may be destroyed without compensation.

Occidentale. [Presence of Aphis maidis, Fitch, en Afrique occidentale. [Presence of Aphis maidis in West Africa.]—Bull. Soc. Entom. de France, Paris, 1914, no. 3, pp. 116-117.

Iphis maidis, the widely distributed pest of maize and Indian millet has been found for the first time in Africa during the past few years. In the French Sudan it has been found both on maize and millet, rolled in in the leaf or on the inflorescence. Although it must be regarded a a pest, it is not the cause of as much damage as is due sometimes to the allied species, A. sorghi, Theo.

SHTCHEGOLEV (Ir.). Непарный шелкопрядь въ Крыму. [Lymantria dispar L. in the Crimea.]— « Садоводъ ». [Horticulturist], Rostor. on-Don, Jan. 1914, pp. 18-30.

This is a short report on the outbreak of Lymantria dispar which took place in 1913 in the Crimea. Normally these insects are not of any great importance, but in 1913 the area infested by them amounted to at least 54,000 acres, mostly forests, with intervening orchards it was already clear in the autumn of 1912 that an outbreak of the peet was to be expected, as an examination of the forests had shown that there was scarcely a tree which did not bear one or two egg. masses. Sometimes three or four layers of eggs were deposited one above the other, and dead moths were frequently found covered with eggs of other moths; the masses averaged 500 eggs each, this number rising sometimes to 800.

The Entomological Station of Simferopol distributed posters and organized a series of popular lectures on the fighting of these insects. while the Administration of the State Domains (having control over the forests) convened a conference of foresters of the Crimea to decidon a plan of campaign. Attention has been chiefly directed to the protection of the orchards which were the most threatened by the outbreak. As to the forests, it was resolved to limit the campaign only to the protection of the more valuable plantations and nurseries for the inaccessibility of the mountain forests of the Crimea renders it impossible to take any effective measures for protecting them that would be worth the outlay. A wholesale destruction of the eggs was carried on in the orchards and neighbouring forests by soaking the egg-masses with carbolineum, or with a mixture of kerosene and birch tar, or with crude oil. This method proved most successful, and was preferable to the scraping down of the masses by means of various tools, for in the latter case a considerable number of eggs escaped destruction. In some localities, where the forest boundaries closes. approached the orchards, a strip of forest was cut down and burn-On the cleared space trenches were dug to stop the advance of the caterpillars, or else boards smeared over with tar or some other sticky material were used. In some places the caterpillars were transported by wind over considerable distances—as much as from four to seven miles-and the fight against them had to be conducted incessantly as constantly fresh swarms were brought by the same means Insecticides were largely used, chiefly Bordeaux mixture with Pars green, the spraying having frequently to be repeated owing to the rains the formula recommended was 2.4 drams of green for 2.7 gallons of Djipsin also proved very useful, while no effect was obtained by such insecticides as tobacco extract, which is harmless in the case of caterpillars covered with hairs. Sticky bands were applied with success; and the caterpillars were also shaken down from the treeand then destroyed by crushing. American tanglefoot being expensive and not being available in sufficient quantity, cart-grease with ordinary birch tar was used as a substitute and also a mixture of castor of with resin $(\frac{1}{2}-\frac{3}{4}$ lb. of resin added to 1 lb. of heated castor oil and boiled to the proper consistency). Notwithstanding the many defects of the latter preparation, it being often either too liquid or too hand it proved very useful, although it required much attention from the owners to keep it in working order.

At a later period in the life of the caterpillars the fight against them *33 assisted by the activity of parasitic Tachinid flies, as well a by an outbreak of flacherie; the pupae also were infected by some lisease. All this led to a diminution of the next generation, which appears at the end of summer, and only a few dwarfed specimens

of L. dispar were found at that time.

According to the author's observations, the eggs are mostly laid at a height of 1-12 ft. from the ground and only in a few cases were they deposited higher, at from 7 to 9 feet; sometimes they were found underneath the surface of the soil, in spaces between the trunk and the earth. His observations do not confirm the common view that the females prefer the southern side of the trees; he sometimes found the northern side of which had more eggs than the southern one, and he is inclined to think that the females are influenced rather by the wind and rain, which drive them to seek protection on the opposite ale of the tree, without regard to the question of light or warmth. As to the kinds of trees not injured by the caterpillars, it appeared that they did not touch pear trees in orchards, even when they were stuated close to apple trees, which were quite defoliated. In forests they did not attack dwarf medlars, although eggs were sometimes band on these trees; ash trees suffered little, while the greatest damage was caused to oaks; all other trees were also more or less mirred. All the searching for parasites of the eggs of L. dispar stoved of no avail and none were reared from the immense number degs kept for the purpose, except for a single egg-mass which contained some 20 specimens of Hadrotus howards, Mokrz. In conclusion the author states that in Russia L. dispar appears in great numbers only during a short period of successive years—rarely more than threeafter which its numbers diminish to quite negligible quantities, chiefly sting to various parasites and diseases, and the unfavourable climatic anditions.

GOWDEY (C. C.). The Yellow-headed Coffee Borer (Dirphya (Nitocris) princeps, Jord.)-Bull. Entom. Research, London, iv. pt. 4. Feb. 1914. pp. 279-281.

This Longicorn beetle is a pest of Coffee robusta and C. arabica in randa; it was recorded as such on C. robusta for the first time in 1010. Some of the estates have suffered serious damage, especially be older ones which are badly affected by the coffee leaf-disease, Hemeleia vastatrix; with a single exception, outbreaks of the pest lave been traced to plots where the leaf-disease was already prevalent

and where the trees were consequently least vigorous.

Regarding its life-history the author has made the following obser-The female beetle loosens a bit of bark on a branch, from 1-5 inches from the tip, and lays its eggs singly under the bark. The roung larva bores into the main stem and downwards into the camtum; the tunnels continue to the surface of the ground and often "Itend into the main root, being sometimes as much as 4 feet in length at distances varying from 2-5 inches horizontal tunnels are bored wing to the exterior, for the purpose of getting rid of the frass. hation takes place in the stem. The beetle has not been observed o leed either on the leaves or on the bark. The life-cycle appears

to be a long one, extending over two or three years, and larvae of various sizes are to be found throughout the year; the pupal stage lasts from seven to nine weeks, usually from November to December

The trees attacked may be located by means of the frass at the base. If the presence of the grub is detected in the branch before it has reached the stem, the branch may be cut off and burned. If the grub has already reached the stem, the method of treatment adopted by the author is to seal up the horizontal exits and to drop a few drops of carbon bisulphide or carbon tetrachloride into the tuned which may be exposed by cutting off the branch through which the insect entered the stem as close to the stem as possible. When the operation is finished the dust, etc., at the base of the tree should be brushed away, for if none is found on the next visit it may be concluded that the insect is dead. Neither of the above liquids has a harmful effect on the trees. Using paraffin oil instead of these liquids or spearing the insect with a wire, as is done in German East Africa for D. usambica, are less satisfactory methods. Trees infested by D. proceps, if untreated, are either killed outright, or broken off by the wind on account of the extensive tunnelling. Trees younger than two years do not appear to be attacked.

Newstead (R.). Notes on Scale-Insects (Coccidae), Part II.—Bwl Entom. Research, London, iv. pt. 4. Feb. 1914. pp. 301-311. 7 figs.

Thirty-seven species of Coccids are dealt with from the following countries: The Dutch West Indies, Barbados, British Guiana Zanzibar, Uganda, Nyasaland, and Nigeria. Five species are described as new, namely Iverym maxima, on Ficus sp., from the Gold Coast-Aspidoproctus giganteus, on the Silk Cotton tree (Ceiba bombar), from S. Nigeria; Aspidiotus (Pseudaonidia) baikeae, on Baikea insignes, from Uganda: A. (P.) fossor, on grape-vine, from Barbados; Chion aspis funtumiae on Funtumia latifolia, from Uganda.

THEOBALD (F. V.). African Aphididae.—Bull. Entom. Research. London, iv. pt. 4. Feb. 1914. pp. 313-337. 17 figs.

A complete list is given of the species of APHIDIDAE recorded from Africa. Several of the species mentioned are common also in Europe such as the Common Cabbage Aphis (A. brassicae) and the Riber and Lettuce Aphis (Rhopalosiphum lactucae); others have a world wide distribution, having doubtless been disseminated on nursery stock; such are the Black Peach Aphis (Aphis persicae) and the Woolle Aphis (Eriosoma lanigerum). As regards the group as a whole # has been very little studied in Africa, and the entire list includes only 35 species. Of these nine are new, namely: Macrosiphum loque spermum, from Njoro, British East Africa; M. lycopersicella or tomato and rape, from Njoro; M. neavei, from Nyasaland; Macro siphoniella bedfordi, on cultivated chrysanthemums, from the Trans vaal; Aphis solanella, from Njoro; A. ligustriella, on privet, from Pretoria; A. nigripes, on willow, from Pretoria; A. africana, et broom-corn and barley, from Njoro; and Lachniella thujafolia. va Thuja orientalis, from the Transvaal.

BALLARD (E.). A list of the more important insect pests of crops in the Nyasaland Protectorate. -Bull. Entom. Research, London, iv. pt. 4. Feb. 1914, pp. 347-351.

A list is given of those insects of economic importance which have iscn collected or bred from various crops in Nyasaland during the est three months of the planting season 1911-12 and the whole of season 1912 13. Insect pests of first-class importance are ten an number and are confined to cotton, tobacco and maize; the others goluded in the list have done sufficient damage to justify regarding them as pests, or are such that an increase in their numbers would le a danger to crops on which they have taken to feeding. Orthoptera: Verminore: The most destructive are Maura bolivari, Kirby, and Octobromus sp., both pests of tobacco; less harmful are Acrida GRYLLIMAE: Bouchytrypes membranaccus, F., sometimes eats the roots of cotton

Lepidoptera: -- Noctuidae: Diparopsis castanea, Hmp. (the Red Boll worm), a major cotton pest of great importance; Chloridea Judita, F., destroys the bolls and flowers of cotton and attacks marze, tobacco seed-pods, and chick-peas; Earius insulana, Boisd., a cotton pest, but partly kept in check by an ichneumon parasite; it is also found on garden Hibiscus; Euxoa segetum, Schiff., is responable for much loss in tobacco fields by cutting the stems; Prodenia Maga, F., occurs on tobacco, cotton and maize, and was once found on teat; other species damaging cotton by eating the leaves in the and stages of growth are Plusia orichalcea, F., Cosmophila erosa, Hb., timitis subulifera, Guen., Plusia chalcites and Acontia graellsii, Feisth. Busseola fusca, Hmp., is one of the worst pests in the Protectorate, causing a great annual loss in the native gardens by boring in the stems of maize and millet. Pteronycla fasciata, Hmp. (gen. et sp. nov.) tores in the stems of cotton, which are consequently very liable to be broken by the wind; it is at present uncommon. Limacodidate: Parasa cicida, Walk., is an occasional but destructive pest of coffee. LYMANTRIDAE: Heteronygmia leucogyna, Hmp., a serious pest of bahogany. Pyralidae: Sylepta derogata, F. is rare in the Zomba district, but is a serious pest of cotton further north; the larvae are parasitised by a Chalcid. TINEIDAE: Phthorimaea heliopa. Lower, a stem-borer of young tobacco and a serious pest; Gracilaria sp nov. !, a common, but at present not serious, pest of cotton. NYMPHALIDAE: Hypolimnas misippus, L. on cotton.

Folcoptera: -- LAGRIIDAE: Lagria villosa, F., moderately destructive a vegetable gardens to leguminous plants. Galerucidae: Ootheca " dabilis, Sahlb., on cotton, leguminous and cucurbitaceous plants; branatha conifera, Fairm., also on leguminous and cucurbitaceous Parts: Asbecesta cyani pennis, Har., on leguminous plants; Pachytoma capulca. Fil., on Mlanje cypress. Tenebrionidae: Zophosis sp., a minor pest of cotton and tobacco; Gonocephalum simplex, F., on tohacco. Meloidae: Mylabris tricolor, Gerst,. M. amplectens, Gerst., M. dieincita, Bert., Decatoma catenata, Gerst., are all destructive dower-eaters, occurring on cotton; Ceroclis trifurca, Gerst., eats the devers of sova and velvet beans. Curculionidae: Apion armipes, $W_{
m agn.}$ on cotton; a species of *Isaniris* is a general but not very destructive pest on cotton. Coccinellidae: Epilachua dregei, Muls. E. hirla, Thumb., and E. paykulli, Muls., are major pests in vegetable gardens; Chilomenes lunata, F., preys on the cotton aphis, and is a very useful insect. Cassididae: Cassida gibbipennis, a minor pest on leguminous plants. NITIDULIDAE: Epuraea sp., eating stamen, of cotton flowers.

Hymenoptera: Tenthredinidae: Athalia sp., a major pest

on turnips and cabbages.

Rhynchota: Aphitodae: Aphis gossypii, Glover, very trouble some on cotton; Aphis brassicae, L., on cabbages; Coccidae Pulvinaria jacksoni, Newst., occurs occasionally on cotton. Coreidae Anoplocuemis curvipes, F., on cotton and on mahogany. Penta Tomidae: Antestia variegata, Thumb., a serious pest of coffee Atelocera stictica, Westw., on young shoots of mahogany. Pyrrho Coridae: Dysdercus nigrofasciatus, Stâl, a major pest of cotton: Odontopus confusus, Dist., on cotton.

Order in Council under Sections 2 and 3 of "The Destructive Pests Ordinance 1912" with respect to Cocoa and Rubber Plants and Seeds. —Gold Coast Government Gazette, Accra. no. 68, 23rd Aug 1913, p. 945. [Received 15th April 1914.]

This Order in Council contains the following provisions: -

It shall not be lawful for any person to import any cocoa or rubber plants or seeds into the Gold Coast Colony except through the Portof Accra and Sekondi. No cocoa or rubber plants or seeds shall be so imported which have not been disinfected before shipment in a manner approved by the Director of Agriculture. All cocoa and rubber plants and seeds so imported shall be accompanied by a certificate, to the satisfaction of the Director of Agriculture, certifying that such disinfection has been duly and properly carried out. All cocoa and rubber plants and seeds arriving without a certificate, or with a certificate which is not to the satisfaction of the Director of Agriculture, shall be destroyed, or landed at such place as the Director of Agriculture may direct and there disinfected under his supervision at the expense of the importer.

VUILLET (A.). Le Thrips du Poireau. [The Thrips of the Leek.]— Rev. Phytopath. App., Paris, i, no. 10, 20th Oct. 1913, pp. 136-137. [Reed. 30th March 1914.]

Thrips tabaci, Lind., is common in both the Old and New World-In the United States it is known as the onion thrips, and it seems to have been introduced there from Europe. It occurs throughout the whole year on a great number of plants belonging to very different families such as the Cruciferae, Leguminosae, Carvophyllacae Compositae, Solanaceae, Labiatae, Liliaceae, etc. The families Liliaceae and Solanaceae are the ones which perhaps suffer the most With regard to the leek, for several years Blais observed that this plant became discoloured towards the middle of summer, whilst small larvae swarmed in the folds of the leaves. In 1913, the first damage was observed at the end of June, and the perfect insect appeared at the beginning of September. The attacked leaves first became

discoloured and then the ends dried off. The plants would not grow and the attack of the Thrips reduced the harvest by 50 per cent. The meets persist through winter generally on stray plants or under dead haves. The time taken for the complete transformation varies greatly according to conditions, the insects observed by Lindeman in Resarabia taking 47 days, while those bred by Quaintance in Florida only 17 days. Most authorities consider that the multiplication of Thrips tabaci is favoured by drought and seriously hindered by rain. The author however is of the opinion that moisture is not really anfavourable to this insect, but rather that drought weakens the plants and diminishes their resisting power. Fields are often invaded Thrips which have hibernated and developed on wild plants. The destruction of such vegetation on the borders of fields would therefore le a preventive measure, especially if it be burnt during the winter. In etler to counteract the effect of drought and allow the plants to resist effectively the attacks of the insect, irrigation should be employed where possible. Most contact insecticides are effective against this Thrus, but unfortunately the insects are difficult to reach since they mour in the folds of the leaves. A simple 3 per cent, soap solution is effective in most cases.

HOLLOWAY (T. E.). The Prospect of controlling the Sugar-Cane Borer more efficiently.—Louisiana Planter and Sugar Manufacturer, New Orleans, La., li, no. 25. 20th Dec. 1913, p. 416, 3 figs. [Recd. 30th March 1914.]

Experiments on the control of the sugar-cane moth (Diatraea sucharalis) have been extraordinarily successful. On the Piper plantation, Texas, no cane trash was burned in the autumn and winter il 1912-13, but it was all ploughed under in the spring of 1913. On the neighbouring plantations the trash was burned in the autumn as asual. On examination it was found that the average infestation of the unburned fields was 30.6 per cent., while that of the burned fields was 76 per cent. In 1912, the average infestation of the burned fields was 50 5 per cent. and a few miles away 86 per cent. Burning over a field is the obvious method of controlling an insect pest in certain cases, but the sugar-cane field presents a different problem. The boters stay in the stalks and when the stalks are passed through the mil the borers are killed. On the field are left a few borers in the bys, and probably more in the stubble, and egg-parasites on the have and in the egg-masses of the borers which are attached to the leaves. If the leaves are burned, many parasites are killed and only a few borers. When the cane begins to grow next season, the borers who up from the stubble, and very few parasites are then present to control them. These parasites are very valuable in destroying the eggs of many other moths besides those of the sugar-cane moth and should in no way be destroyed. From these experiments the author is of opinion that the disposal of the trash by ploughing under will give the most satisfactory results, though he notes that the plan raking the trash to the headlands, as done by Mr. Taggart at Andubon Park, resulted in a greater reduction in the percentage of infestation than was accomplished by ploughing the trash under in the spring in Texas.

MORGAN (A. C.) & CRUMB (S. E.). The Tobacco Splitworm.— Bull. U.S. Dept. Agric., Washington, D.C., no. 59, 19th Jan. 1914. 7 pp. [Reed. 14th April 1914.]

The tobacco splitworm (Phthorimaea operculella, Z.) has been reported as having done serious damage to the potato in California The variation in food habits had created the suspicion that the form working upon potatoes might be specifically distinct from the one attacking tobacco. During the summer of 1913 experiments were conducted to determine this point. The earlier stages of the two types differ only in size and coloration. By transposing the food-plants the larvae can be made to approach each other in colour, and this character is therefore scarcely sufficient to justify a specific separation. The difference in size disappears when the potato-tuber moth is reared on other plants. In the United States the species occurs in California and southward from a line connecting the District of Columbia and Colorado, including Tenessee, Virginia, North Carolina, South Carolina Florida and Texas. The known range also includes Cuba, Costa Rica, Peru, Hawaii, Australia, Tasmania, New Zealand, Sumatra, Transvaal Rhodesia, Algeria, and Southern Europe. The known food-plants of Phthorimaea operculella include Solanum torvum, S. verbascifolium. S. carolinense, S. nigrum (1), egg plant (S. Melongena) potato, tomato, Physalis peruviana, Physalis sp., Physalodes physalodes, Datura stramowium, and tobacco. The larva occurs as a borer and also as a leaf miner. the former probably being the original habit. In Cuba and the United States the insect is known on tobacco as a leaf-miner only. A boring tendency is still apparent, however, as noted by Houser, in that the larva usually tunnels the midrib or a vein in addition to mining the membrane of the leaf. Only the older tobacco leaves are affected. unless the infestation is very severe, and they become blotched, the tobacco being rendered unfit for wrappers. In mining the leaf the larva spins a tent of silk and under this consumes the parenchyma Eggs are deposited singly on the foliage of the host plant and, after about four days, the larvae emerge. The larva is very active and continues its work for about 15 to 17 days, after which it pupates in a tough cocoon of silk and débris in the clods or rubbish at or near the surface of the soil, the pupal stage lasting from six to nine days Descriptions are given of the various stages and tables showing the times occupied by them. Two larval parasites are recorded, namely the Braconid, *Chelonus blackburni*, Cam., and the Ichneumonid. Limnerium polynesiale, Cam. As remedial measures Quaintance recommends pinching the larvae in the leaves and the destruction of all trash in and around tobacco fields and barns. In severe infestations it may be necessary to prime off and destroy the leaves infested by the earlier generations. It is also well to transplant the crop as early as possible, in order to mature it before the appearance of the most destructive generation of the splitworm. All tobacco stubble should be destroyed as soon as the crop is harvested, to prevent the breeding of a hibernating generation. Potatoes should not be followed by tobacco, for the infestation of tobacco has been more severe in such cases, than where a different rotation was followed. Potatoes and tobacco should be grown as far apart as possible.

Mittellungen der Station für Pflanzenschutz in Hamburg. [Communications from the Hamburg station for plant protection.] Zeits, für Pflanzenkrankheiten, Stattgart, xxiv, no. 1, 31st Jan. 1914, p. 41.

The San José scale was found on 2·29 per cent, of fresh fruit imported from North America, and on 0·25 per cent, of that from Australia The living plants on which it was found were two *Peanus* in pots from Japan. The drought caused an increase of the Aphids on many field and garden fruit-trees, many varieties of beans suffering from the attacks of the black aphis. Bird protection was advanced by the provision of suitable copses, nesting places, feeding places and the circulation of advice on the subject.

Johnson (F.). The Grape Leafhopper in the Lake Eric Valley.—Bull. U. S. Dept. Agric., Washington, D.C., no. 19, 24th Jan. 1914, 47 pp., 13 figs., 3 pls.

The grape leaf-hopper, Typhlocyba comes, Say, and its several varieties are of common occurrence on native grape-vines throughout the United States and Canada, having been first recorded from Missouri in 1825. During the growing season of the grape-vine, this leaf-hopper apparently confines its attacks to the foliage of this plant. Early in the spring the adults feed on the new foliage of almost any plants with which they come in contact, whether it be the foliage of trees and shrubs in woodlands, or the weeds and grasses in the more open arable and pasture lands; but when the leaves of the cultivated vines unfold there is a complete migration of the hoppers from the wild plants, including the wild grape-vines, to the cultivated vines. By repeated observations it has been found that this insect reproduces only on the foliage of wild and cultivated grapes, and more freely upon the latter. The insect in its nymphal and adult stages sucks the juices from the leaves, causing, in severe cases, the whole vine to become dried up and almost functionless long before the normal ripening of the fruit. Prof. H. J. Quayle states that with the exception of Phylloxera, the vine hopper is undoubtedly the most destructive insect pest of the sine in Ohio State. The insect is generally present everywhere and may occur for several seasons without attracting attention; then it begins to increase and finally becomes so abundant as to cause severe damage. The species most commonly associated with T. comes is T tricincta, the proportion of the species varying in different areas. T. rulnerata was also present on the North, South and Middle Bass blands, and on Kelly's Island. The adults usually commence to attack the vines about the middle of May, and in 1912 the first eggs aere found on 10th June, and the appearance of a new brood occurred on 12th July. From experiments it would seem that some females may deposit about 140 eggs. In normal seasons the majority of the and brood adults appear after the middle of July and the nymphal period is lengthened by low temperatures. If high temperatures prevail, the nymphs develop rapidly and these will mate and deposit ears resulting in a second brood of nymphs. Towards the middle and end of September, the adults of both broods migrate from the vineyards and come to rest in adjoining woodlands or rough pasture lands, later seeking the shelter of leaves and trash. During investigations on this pest only one instance of parasitism was noted, when P. R. Jones

observed a female Aphelopus sp. (PROCTOTRUPIDAE) thrusting her ovipositor into the body of a nymph. On the other hand the nymphs seem to be specially subject to the attack of predaceous enemies which include Hemerodromia superstitiosa, Say, and Hyaloides vitripennis, Sav. Rhyncholophus parculus, Banks, the larvae of Chrysopa, ants, and coccinellidae, and spiders. In one case the leaf-hoppers were found to be attacked by Empusa, sp. Numerous control methods are mentioned and references to them given in a lengthy bibliography. In the vineyards in Chautauqua County, N.Y., Slingerland carried on extensive experimenta with sticky shields for catching the adults before the commencement of oviposition, the most practical shield for trellised vineyards being constructed and used as follows: Make a light wooden frame about seven or eight feet long and four feet wide, having the bottom cross. piece about a foot from the ground and fasten to this stiff wires extending down nearly to the ground and bent inward something like hay-rake teeth. Tack over this a strip of table oilcloth I | yards wide and let it extend down over the curved wire teeth so that when the shield is held beside a vine, the oilcloth will come under the vine to catch the "hoppers" that try to drop to the ground. Cover the oilcloth with the "stick-em" and all is ready to operate. Two men. each carrying one of these light sticky shields on opposite sides of a trellis of vines, can reach over the shields, jar the vines to disturb the "hoppers" and thus go over an acre of vineyard in a little more than an hour.

In California, where the vines are not trained to a trellis, Mr. Quayle found that a screen cage, having the inside smeared with crude oil, with one side open and a V-shaped opening cut in the bottom to admit the stem of the vine, could be used quite effectively in the vineyards to catch the adults before oviposition commenced. Owing to the migratory habit of this insect the destruction of leaves and trash in vineyards cannot have very great results. Sprays used against the adults are of little value owing to the agility of the winged insects and the protection afforded to their bodies by the wings. Against the nymphal stages the following solutions have been used with great success:-1 lb. whale-oil soap to 15 gallons of water; or 1 lb. resin to 15 gallons of water, adding enough soda or potash to dissolve the resin completely, i.e., 1 lb. of soda to about 8 lb. of resin. This soapy liquid has a tendency to form a drop on each berry which causes an undesirable discoloration on the grapes. In the last few years there fore tobacco extracts have been used instead. These, used according to the following formulae, have given excellent results: (a) tobacco extracts containing 2.7 per cent. nicotin sulphate, diluted in the ratio of 1 part to 150 parts of water; (b) tobacco extracts containing 40 per cent. nicotin sulphate, diluted in the ratio of 1 part to 1,500 parts of water. The most effective time to make the tobacco spray application against the nymphs is just before those that hatched earliest in the season have reached the fourth moult, i.e., when the wing pads extend about one-third the length of the abdomen. When it is deemed expedient to use sticky shields to capture the adults. the best sticky substance to use is a mixture of melted resin, I quart, in I pint of castor oil, smeared liberally over the face of the shield. Successful control of the nymphs by spraying depends on thoroughly wetting all parts of the underside of the infested leaves with the spray liquid.

MORSTATT (H.). Arbeiten über Schädlinge der Kulturpflanzen. (Studies of pests of cultivated plants.)—Der Pflanzer, Dar-es-Saluam, x. no. 1, Jan. 1914, pp. 36-39.

This is a chapter of Dr. Morstatt's Zoological Report embodied in the Annual Report of the Biologisch-Landwirtschaftliches Institut at Amani. 1912-1913. No extensive outbreaks occurred in the twelve months under review. Some damage was done by Pseudococcus citri to mango and other trees, chiefly on the coust, and by a weevil, Apion studio-stylum, to cotton in Morogoro; a disease of cotton was caused by Aphids in Mwanza, and a great increase of Coccus viridis on coffee was observed in Meru. With the exception of that of Apion, all these epidemics were probably connected with the dry weather.

Cotton pests. The weevil already mentioned requires serious attention as it has been shown that its larvae also develop under the bark of the woody portions and this often seriously checks growth. The Mafuta disease due to Aphids is not important. Reported from Amani last year, the boll-worm Pyroderces simplex (gossypiella), Whan, has now appeared in Mombo. It is of no importance compared with the pink boll-worm. Another species of stainer, Dysdercus following, Gerst., now brings the number known up to five. In general it does little damage.

Coffee pests. The white coffee borer Anthores leuconotus was reported from plantations hitherto immune in Usambara, Kilimandjaro and Meru. A regular control is necessary, as this pest constitutes a constant danger to the plantations, although with careful planting supervision serious damage need not be feared. The effect of weather conditions combined with thorough preventive measures have brought the green scale under control.

Posts of Vegetables. A sawfly, Athalia sp., has much increased and relative did great damage to mustard and other cruciferous plants. The diamond backed moth, Plutella maculipennis, Curt., was as manerous as in the previous year.

Cuam pests. Ceratitis anonae, Graham, attacked cacao, but so far the ripening of the pods has not been affected. A leaf-eating weevil, Psychobotus transversalis, Fst., also occurred on cacao.

Rubber pests. A termite near Termes natalensis, Hav., and new to East Africa, is an important new pest. It destroyed numerous Mandot glaziovii trees in various plantations. It either gnaws the wood under the tapped bark, or destroys the roots. A detailed report all follow.

Hern pests. The Wonder beans (Kundebohne) planted at Amani were badly attacked during the year. The small weevil, Apion ream var. vicinum, Wagn., was the pest most frequently met with he beans planted for the purpose of breeding the pests, the beetle line beaches chinensis, L., developed in large numbers. Other beetles lead there were the Anthribid, Araeocerus fasciculatus, de G., and a very small Scolytid. Three moths also occurred, Sitotroga cereatella, 61, being the commonest.

Commit pests. The palm beetle, Rhynchophorus phoenicis, occurs in the Dar-Es-Salaam district, but is not an important pest as yet.

Extrait du Procès-Verbal de la Séance de la Section de l'Entomologie, {Extract from the Proceedings of the Meeting of the Entomological Section.} -Bull. Soc. Nat. Acclimat., Paris. lxi. no. 3, 1st Feb. 1914, pp. 84-85.

M. Rivière reported on the damage caused by the bug, Aelia german, to cereals. This insect appears to be spreading in North Afrea, especially in the province of Oran, Algeria. The insect attacks the ear of the cereals and sucks the sap from the seed, preventing germanation. Several plants, chiefly graminaceae and especially the genus Stipa, seem to be visited by these insects, and at night Aelia takes refuge in other plants, returning to the cereals during the daytime. No method of control is known. Aelia germani closely resembles A. acaminata, L., which is common throughout Europe.

Termites or white ants.—Agric. News, Barbados. xiii. no. 309, 28th Feb. 1914, p. 74.

The occurrence of termites in St. Kitts, as a pest of growing sugar cane, has been referred to from time to time. Collections of these and other termites, from the same and other islands, have been made and sent to the Imperial Bureau of Entomology for study. The material submitted was found to include eleven species, of five genera-Culotermes balloni occurred in Grenada and St. Vincent, C. castanese in Barbados, C. incisus in Barbados and St. Kitts, and C. venezolanus in St. Kitts. Entermes acaquilae occurred in Porto Rico, E. costaricenso in St. Kitts,* E. haitiensis in Montserrat, Antigua and St. Kitts. E. sanctae-buciae in St. Vincent. Leucotermes tenuis occurred in Barbados, Mirotermes marshalli in St. Kitts and Rhinotermes marginalis in Barbados. Leucotermes tennis is the species responsible for the serious injury to cane in St. Kitts, while the species of Euterness attack cane plants in the field in Antigua and Porto Rico. Two species of Caloternes attack living trees C. balloui being reported from cacao trees in Grenada, and from the heartwood of a Pithecolobian in St. Vincent, and C. incisus in the wood of a living avocado pear tree in Barbados.

COMTE (··). La Mouche du Chou. [The Cabbage Fly Chortophili (Anthomia) brassicae, Bouché.]—Rev. Agric. Vitic. Afr. Nord Algiers, xii, no. 101, 14th Feb. 1914, pp. 148-151, 2 figs.

This insect is a fly of the family ANTHOMYIDAE, the larvae of numerous species of which live in decomposing vegetable matter and occasionally in the digestive tracts of animals. In the adult stage they cause injury to the plants by sucking out the juices. According to A. Mazières, the cabbage fly caused serious damage to young cruci ferous plants in Algeria during the autumns of 1911 and 1912. In Tunis, where similar damage is done, the author found that the bionomics of this insect differed greatly from that given by Mazières Great variations also exist between Central and Northern Europe in this respect, since the climatic conditions are very different. The

The localities for E. acaquillae, E. costaricensis and E. sanctar-breior have been altered in accordance with a correction published in the Agric. News for 14th March, 1914, p. 90.

adalt appears in autumn, and the female deposits about 50 eggs on the stems and on the lower parts of the petioles of the leaves. The larvae emerge about ten days later, and feed on the delicate young leaves. After about four weeks they pupate in the plant, or more often in the soil, and 15 or 20 days later, according to the temperature, the adults of a new generation appear. Usually there are three genera mons a year, the adults appearing in October, January and March. Metamorphosis is slightly retarded in winter, but is completely suspended in summer. Three or four larvae are sufficient to stop the development of a young cabbage; the older plants are more resistant. This insect may be controlled to some extent by insecticides; e.g., a mixture of 60 parts of lime and 30 parts of fresh pyrethrum powder. of a 12 per cent, emulsion of petroleum and water. These insecticides will not destroy the eggs nor the larvae, serving only to keep away the adults at the time of oviposition. The petroleum may be used on young plants which are not to be offered for sale for two or three months. In infested fields, plants containing larvae should be pulled up and burned.

SCREACE (H. A.). Angoumois Moth. - Wkly. Zool. Press., Bull. Dept. Agric., Harrisburg, Pa., no. 257, 30th March 1914.

The Angoumois grain moth (Sitotroga cerealella, Ol.) occurs abundantly in Berks county, Pa. It lays its eggs on the wheat while in the straw and if wheat is permitted to remain unthreshed in the barn the moths infest it. Wheat threshed early is safe from attack. If at once placed in bins it can then be kept without serious damage except to the top layer, in which the pest can be killed by sprinkling earlier by the strain over the wheat and covering with wet blankets.

VCILLET (A.). Un ennemi du fraisier. [An enemy of the strawberry plant.] -Rev. Phytopath. App., Paris, i. nos. 6 & 7, 20th Aug. and 5th Sept. 1913, pp. 97-98.

In June 1913, the Entomological Station in Paris received two specimens of a Tenthredinid larva injuring strawberry plants. From these Chalius (Piophorus) padi, L., were bred. Though not previously recorded, the presence of this insect on the strawberry is not surprising, as it feeds on many plants. Cameron states that the eggs are laid on the under side of the leaves, early in May. The very young larvae only attack the epidermis, but later on they make large holes in the stem and if present in numbers, considerable damage may be done. There are several (2-4?) generations in a year, the number probably varying with the locality. The nymphal stage, of the summer reperation at least, is passed on the ground in a white cocoon spun among the dried leaves. The larva of Chalius padi is parasitised by Lephon lucidulus, Hart., and Ichneutes reunitor, Nees. Spraying the neder side of the leaves with nicotin or arsenic might be practised before flowering takes place and also after the crop has been picked.

Vargar Vergara (J. M.). El mión. [The froghopper (Tomaspis logotensis].]—Rev. Minist. Obras Publicas, Bogotá, xii, nos. 10-11-12, Oct.-Nov.-Dec. 1913, pp. 470-472 and 547.

For years pastures in the Tocaima and Casasviejas region of Colombia have suffered from the ravages of an Homopteron of the genus Tomaspis. Specimens sent to the Imperial Bureau of Entomology have been determined as T. bogotensis, Dist., sp. n. The insect is known locally as el Mión.

Wildon (G. P.). A case of arsenical injury to apricot trees.—Mthly Bull. State Comm. Hortic., Sacramento, Cal., ii, no. 12, Dec. 1913 pp. 766-768, 2 figs. [Received 22nd April 1914).

It has been known for some time that arsenic applied to trees in the form of lead arsenate, Paris green, etc., for the control of insect pests may accumulate at the crown of the root and a sufficient amount become soluble to corrode the bark and girdle the tree. The foliage becomes small and yellow early in the season; usually the crop is heavy and also highly coloured. Longitudinal cracks occur in the bark which may also be of an unnatural colour. In all cases the injury to the bark begins on the outer surface, and gradually eats its was through to the cambium. The wood, both of trees and roots, is moreor less blackened, and, when injury is at all severe, girdling and death takes place.

A case of injury to apricot trees is noted from King's County. Early in the season climbing cutworms gave great trouble and the owner of the orchard heaped a mash of bran and Paris green about the root crowns of the affected trees. Later the orchard was irrigated and the trees soon became sickly, many dying outright. On 28th October some of the trees were still alive, but showed the characteristic symptoms of arsenical injury. It seems probable that alkali in the soil and water aided the breaking down of the Paris green, thus liberating soluble arsenic which damaged the trees. Orchard owners are warned to be moderate in the use of arsenic, and if there is any possibility of the formation of a collar of arsenic at the ground line, the soil should be removed, and with it the arsenic which unavoidably runs down the trunks in the process of spraying.

VOSLER (E. J.). | Recent importations of beneficial insects into California.—Mthly. Bull. State Comm. Hortic., Sacramento, Cal., ii. no. 12, Dec. 1913, pp. 770. [Received 22nd April 1914].

The State Insectary received in August from Mr. H. A. Ballou, of the Imperial Department of Agriculture for the West Indies, a consignment of parasitised black scale material, from which were reared several hundreds of specimens of the predaceous egg parasite. Lecaniobius cockerelli, which have been liberated in an infested section, and the results are awaited with interest.

Professor S. I. Kuwana sent a consignment of mealy bug parasites from the Imperial Agricultural Experiment Station of Japan. Various species of hymenopterous parasites have been reared from this material and they are now being bred in quantities for release in infested sections.

From the Philippines red scale infested with a small internal parasite was received, and also two consignments of black scales from which a Pteromalid egg parasite was obtained. Mr. C. H. T. Townsend sent parasitised black scales from Peru, from which several specimens of a large Encyrtid, which attacks old scales, were obtained.

VOLSER (E. J.). Calendar of insect pests and plant diseases.—Mthly. Bull. State Comm. Hortic., Sacramento, Cal., ii, no. 12, Dec. 1913. pp. 772-775. [Received 22nd April 1914].

The author mentions the red-humped caterpillar, Schizure concurred S.A.A. as requiring checking in December and January by hoeing and cultivating close to the fruit trees. The California tussock moth illenerocampa vetusta, Boisd.) is distributed throughout the central portion of the State, and is especially abundant along the coast. It feeds on the leaves and young fruit of the apple, as well as upon live oak, lupin, cherry and walnut, though the apple is the favourite. When caterpillars have been abundant during the previous season, the author advises handpicking the egg-masses from the limbs and trunks of trees in the late autumn. They should be destroyed by burning or immersion in oil.

STABLER (H. P.). Red spider spread by winds.—Mthly. Bull. State Comm. Hortic., Sacramento, Cal., ii, no. 12. Dec. 1913, pp. 777-780, 2 figs. [Received 22nd April 1914.]

The author says that in the summer of 1912, a fruit-grower and ausseryman of Sutter County, became convinced from his own hiservations, that red spiders are carried by wind to a greater distance than is generally supposed. It has long been known that red spiders may be blown from one tree to another, or blown through several rows of trees, but it was generally supposed that a main road, a piece of open ground or similar barrier, was sufficient to prevent the spread of the prot by these means. The matter has been investigated by Mr. E. E. Munger of Yuba City, by placing a sheet of sticky paper on a board astened to a fence twenty feet away from an infested tree. Twentyfour hours afterwards a great many spiders were found on the paper. On the 5th August a similar experiment was made and the paper was attached to a telephone pole twelve feet above ground, and one hundred feet to the north of a badly infested ten-acre almond orchard of very large trees. Numerous spiders were found next day. On the 10th August, a paper was placed 250 feet from the orchard and 30 feet from the ground and many spiders were found the next day. It was then removed to 650 feet from the orchard to the top of a school house, with the same results.

Experiments were repeated with precautions to preclude all institutions to preclude all institutions of the red spiders having reached the paper in any other way than by wind carriage. The results were again the same, and it is regarded as established that red spiders are blown sufficiently far to make infested orchards a menace to other orchards within reasonable distances.

Stewart (V. B.). The Importance of the Tarnished Plant Bug in the Dissemination of the Fire Blight in Nursery Stock.—Phylopulogy, Baltimore, iii, no. 6, Dec. 1913, pp. 273-276, 1 pl.

Considerable attention has been given during the past few year, to the dissemination of the fire blight bacterium (Bacillus amylicoras, in nursery stock, by various insects. Insects already recorded as of possible importance in this connection are Aphis pomi, and the following species of sucking bugs :- Reduciolus ferus, Plagiognathus politicas Platymetopius acutus, Empoasca mali, Typhlocyba rosae, Campylomna cerbusci, Lygus pratensis, Orthotylus flavosparsus, Chlamydow, associatus, Cosmopeplu varnifex and Siphocoryne avenae. Among these the tarnished plant bug, Lygus pratensis, has appeared to be the most important in transmitting the blight parasite to healthy trees During July 1913, this insect was very abundant on apples, and as a rule, the blight became more prevalent with their appearance Experiments were made in order to ascertain to what degree the insert was responsible for its spread; it was shown that insects visting blighted tissue become smeared with the gummy exudation from the blight lesions and carry bacteria to the tender twigs; here, in sucking the sap, the insects puncture the tissues, thus forming a means of entrance for the blight germs, with the result that the twigs may soon become infected. These facts emphasise the importance of removing all blight infections as soon as they appear, as without the sources of infection, the presence of disseminating agents is not so important Pears, as well as apples, have had the blight transmitted to them in this way.

CRAWFORD (J. C.). Descriptions of new Hymenoptera, nos. 6, 7, 8.
Proc. U.S. Nat. Mus., Washington, xlv, 22nd May, 1913, pp. 241-260; xlv, 22nd May, 1913, pp. 309-317; xlvi, 23rd Dec., pp. 343-352.

These three papers are systematic in character. The first includes a number of new species, the following being those of economic importance: Bruchorida vuilleti, sp. n., from Senegal; Bruchorida from Bruchus interpolation, at Bangalore, India Coccidoxenus portoricensis, sp. n., Porto Rico, reared from Bruchus quadremaculatus, (no habitat given); Bruchobius colemani, sp. n., from Bruchus chinensis, at Bangalore; Cassidocida aspidomorphae, sp. n. reared from the larvae of Aspidomorpha miliaris, at Bangalore.

Most of the species described in the second paper are of economic importance. Cercocephala atroviolacea, sp. n., from New Mexico: Derastenus agromyzae, sp. n., from Indiana, U.S.A., host Agromyza angulata: D. arizonensis, sp. n., from Arizona: D. variipes, sp. n., from Indiana, Agromyza pusilla; Entedon thomsoni, sp. n., from Indiana, reared from Agromyza angulata; Cirrospilus flavoriridis, sp. n., from Utah, reared from Agromyza.

The third paper contains the results of an examination of a small but extremely interesting collection from Trinidad, sent by Mr. F. W. Urich. Among the new species described are: Telenomus tabanocida. reared from Tabanid eggs; Perilampidea syrphi, reared from the larvae of a Syrphid preying on Dactylopius citri, found on cacao; and Signiphora giraulti, bred from Dactylopius citri.

ZAPPELLI (P.). Anche la "Mosca olearia" finalmente è vinta ! [The olive fly has at last been conquered.]—L'Agricoltura Sabina, Poggio Mirteto, xii, no. 12, 31st Dec. 1913, pp. 49-50.

The author states that efficient defence against the olive fly is provided by Professor Lotrionte's system of poison traps, called capannette" (little huts) because of their shape. A sheet of tin, Hinches by 10 inches, is bent into a V-shaped gutter which is inverted to form a roof for a bundle of dried olive twigs placed in the hollow and retained there by two galvanised iron wires. The ends of these are brought through the ridge of the roof and are then wound round the lowest horizontal branch of the olive tree requiring protection. It is necessary for some of the twigs to protrude from under the edges of the roof and also for the trap to be fastened very firmly to the branch to prevent it swinging about. Before fastening it, the twigs should he well wetted with the following mixture: Liquid glucose 50 to 60 parts, sodium arsenite 2 parts, boric acid 2 parts, borate of soda 2 parts, all by weight. One trap per tree is required where the tree has bew branches and two traps where branches are numerous. If the system is adopted throughout the whole of an extended olive-growing region, one trap for every three or four trees may prove sufficient. Care must be exercised to avoid spilling or dropping the mixture on the leaves and branches of the tree. The mixture must be re-applied about five times during the season by means of a spray pump, with careful attention to avoid spilling. In an experiment which was carried out on about 1,500 trees, the traps were placed in position in the and of June and beginning of July. The five renewals of mixture were made on the following dates:-From 15th to 16th July, 6th to 8th August, 25th to 27th August, 8th to 10th September, 2nd to 5th October. To check results, "control" olive groves were chosen adjoining, but higher up the slope than the plantations treated. As the fly prefers low-lying areas, the control plots were in a more favourable position than the others. Yet of the olives gathered from these trees, from 30 to 50 per cent, were infested and the olives which had fallen on the ground showed a percentage of 80 to 90. In the protected plantations these figures were respectively 1 to 2 per cent, and 4 to 5 per cent. Proceeding to the store-room, a handful of olives from the control trees and another from the treated ones, were taken from the teaps, and whereas the first had 50 per cent, of the fruit damaged the others were quite perfect. The grower had also sprayed the crown of the treated trees with acid Bordeaux mixture containing I per cent. lime and 13 per cent. copper sulphate, with the twofold aim of combating Cycloconius and of hardening the olive skins and thus rendering imore difficult for the fly to pierce them; the same spray was usedthough to a less extent—on the control trees. The attack of the fly also occurred this year at a very late date-in October-when the iruits were already about to ripen. Thus the results attained are entirely due to the new system. In another district the same ex-Finnent was made on over 1,500 trees and with practically identical results. The problem may, in the author's opinion, be considered wilved.

Dalmasso (G.). Un metodo singolare di lotta contro le tignuole dell'uva. [A doubtful method of combating the vine moth.] Riv. Vitic. Enol. Agrar., Conegliano, xx, no. 1, 1st Jan. 1914, pp. 6-10.

Experiments made at the Government Enological School at Congliano go to support the view advanced by Moreau and Vinet [e.f. this Review, Ser. A., ii, p. 16] that vine moth control by capture in wine-traps is unsatisfactory. The author concedes that weather conditions were mostly unfavourable, but ill-success cannot be wholly ascribed to this cause, and, in any case, a method which depends so much on suitable meteorological conditions is a very uncertain one at best as the expense for material and labour is considerable and the traps may be washed out several times in a month by rain. During the month of July 1913 alone, at Conegliano, no less than $5\frac{1}{2}$ inches of rain fell, distributed over 16 days; the traps were either completely washed out or the liquid so diluted as to be uscless, and generally there was such a development of mould that the liquid rapidly ceased to attract.

FOUCHER (G.). Cecidomyid Flies attacking Willows.—Bull. Soc. Nat. Acclimat., Paris, Ixi, no. 1, 1st Jan. 1914, pp. 23-26.

The habits are recorded of two willow-feeding Cecidomyias of the genus Rhabdophaga, R. rosaria, H. Loew, and R. pulvini, Kieff. The former lays its eggs on the tips of the branches, causing a cessation of growth, and the larvae develop in galls forming a terminal rosette. The larva of R. pulvini lives in the pulvinus of the leaf, where its presence is indicated by a swelling. Infested branches wither and dry completely. In spite of their small size, these two Cecidomyias sometimes cause considerable damage in osier plantations, where they chiefly attack Salix purpurea, depressa, aurita and cinerea. The only preventive measure is to remove the infested branches and carefully burn them.

SHTCHEDRITZKY (-). О поврежденіяхъ озимыхъ всходовъ.—10n injuries to the shoots of winter-sown grain.] «Сибирское Сельское Хозяйство.» [Agriculture of Siberia.] Тотяк. Jan 1914. pp. 4-5.

The author warns agriculturists of the district of Tomsk, against injuries to their winter-sown crops which may result from the activities of larvae of Euroa segetum. These insects appeared in some parts of the district last autumn and it is likely that, after hibernation, they will again cause damage till about the end of June. To protect the crops from further injuries he suggests harrowing the fields on which the pests appeared last autumn, as soon as the ground thaws, and digging trenches round the areas that were stripped. To prevent damage to autumn shoots he recommends ploughing the fields for the winter crop as early as possible, in any case before June, and subsequently making round the fields a trench about 8-9 inches deep and of the width of a spade; frequent harrowing is advised to prevent the growth of weeds. The author concludes with a brief description of the larva and perfect insect.

KOSTAREV (N.) O борьбъ съ плодомормой. [The fight against Cydia (Carpocapsa) pomonella, L., and Cydia (Grapholita) functiona, L.] - «Плодоводство» [Fruit-Growing], St. Petersburg, Jan. 1914, pp. 32-38.

This is a paper read by the author at the general meeting of the Russian Imperial Society of Fruit-Growing in December last. He refers first to the enormous amount of damage done by Cydia pomonella. which injures as much as 60 per cent, of the apples in the Crimea, while in the governments of Astrachan and Ekaterinoslav and elsewhere, the figure amounts to 90 per cent., thus causing yearly a loss to inut-growers estimated to reach millions of pounds sterling. While or disputing the importance of the principle of fighting the pest by means of its parasites, the author considers that this method has not et given practical results in the orchard. He points out the good results obtained in America by means of spraying, and advocates the methods suggested by Dr. Ball and Professor Melander, i.e., spraying ander high pressure and directed downwards [see this Review, Ser. A., 10. 276]. He then goes on to deal with Cydia funcbrana, the damage done by which is more indirect than direct, for its attacks induce the development of the fungi, Monilia fructigens and M. cinerea.

He further gives an account of some experiments conducted in satchi, where C. funebrana starts ovipositing after the 14th May. Bordeaux mixture and lime-sulphur, which are so effective against the ingus Phyllosticia prunicola, proved less so against Monilia. About 2 pints of kerosene emulsion to 10 gallons of Djipsin gave good results, but this insecticide is too expensive; the cost per tree was 14s., as the spraying had to be repeated every 10 days, i.e., 14 times during to summer. A casual observation, that in orchards in which the cauntity was too small to be worth harvesting, the plums were less damaged, has led to further investigations which proved that, in sichards where no harvest was obtained one season, the plums were healthy the next year; while in orchards which yielded a good crop the year, the next was considerably diseased with Monilia, and the third was altogether ruined. This is explained by the fact that the cajority of C. funebrana live only one year, and if the next generation usels no food owing to a bad harvest, it dies out; the moths do not fly or and the greater the area affected by a total bad harvest, the less why are they to appear next year. This led the author to try to prevent a harvest in plum orchards artificially once in every three years, iv burning the blossoms of plum trees with sulphate of copper; as a isult, splendid plums were obtained and the yield increased, for having had a year of rest, the trees bore a heavier crop.

In summarising his remarks the author recommends the following ampaign against C, funebrana:—(1) The blossoms of plum trees each to be burnt with sulphate of copper once in three years, or in a fird of the orchard every year, which remedy destroys also many insus diseases; (2) during the winter and early in spring the withered must be collected and destroyed; (3) the earth in the orchard must be kept friable till the fruits acquire their normal colour; (4) be plums which turn red at the beginning of summer, when the bulk it the plums are still green must be removed and destroyed, as well as all rotten fruit; (5) the following spraying operations are advocated:

(a) Before the unfolding of the flower-buds, spray with Djipsin along 2 lb. in about 46 gals. of water) as a remedy against Rhynchia and with Bordeaux mixture (4 lb. of lime and 4 lb. of sulphate of copper in 46 gals. of water) against Monilia; (b) during the time of blossoming, spray with weak Bordeaux mixture to prevent the growth of Monilia, this liquid being quite harmless to bees; (c) immediated after the petals have fallen off, spray with djipsin and kerosense emulsion against C. functurana and other pests, and with Bordeaux mixture against Monilia; (d) 15 days after that, spray again with weak Bordeaux mixture, which must be repeated in the first half of July and again in August; (e) if Aphids should appear spray with tobacco extract before the leaves begin to curl.

La Diaspis pentagona ed il modo di combatterla. [Aulacaspis (Dragonis) pentagona and the method of combating it.]—L'Agricoitage pratico, Genoa, vii, no. 1, Jan. 1914, pp. 5-6, 7 figs.

The endophagous parasite, Prospattella berlesei, How., has proved of great value in controlling the mulberry scale. In Italy, huge tree entirely covered with A. pentagona were completely freed in 18 month. The female Chalcid pierces the Coccid with her ovipositor and deposition and great its body. The larval, and sometimes the nymphal, stage of the parasite is passed in the body of its victim, which is devoured until only the skin is left. The scales killed thus assume a bright red brack colour and become transparent and fragile, which is not the case when death is natural. This is a useful indication. Prospattella has four to five generations in a year, all the offspring being females, which lav about a hundred eggs each.

GOURLEY (J. H.). Spray Calendar for New Hampshire.—New Hampshire College and Expt. Sta., Durham, Extension Circular no. 10, Jan. 1914, 12 pp. 3 figs.

The actual spraying tables are preceded by spray formulae, with full instructions for their preparation. With these is given a threcolumn dilution table. The first column shows the strength of linesulphur solution expressed in Beaumé degrees, the second the corresponding number of gallons of water required to dilute 1 gallon of linesulphur for dormant spray, and the third the corresponding number of gallons for summer spray. For instance, to make up a domast spray, 2 gals, of water should be mixed with 1 gal, of lime-sulphur of 15° B., or 8 gals, water with 1 gal, of 33° B.

Pratt (H. C.) and South (S. W.). Progress Report on Locust Work to November 30th 1913.—Agric. Bull. F.M.S., Kuala Lumpur. in no. 6, Jan. 1914, pp. 152-156.

So far as can be ascertained, locusts are still confined, in the Federated Malay States, to the States of Selangor and Negri Sembilan. Many swarms of hoppers have been reported from Malacca territory, but none as yet from Pahang. No northerly advance has been made since the last generation. In Selangor during November, there have been no hoppers and the number of swarms decreased from the beginning of the month onwards, swarms probably joining forces.

Egg-laying is expected to commence shortly and the breeding-grounds are being carefully watched. In Negri Sembilan during October and November, the swarms were very numerous and individually small. The periodicity which is so marked a feature in the alternation diliers and hoppers in Selangor is not so marked in Negri Sembilan, and both have been present all the time. The area of distribution here s very wide, and help has been given in the work by assistants from Slangor. Most locusts have been destroyed by the sheeting and bagtrap method [see this Review, Ser. A., ii, p. 110]. For the locusts in saidy small quantities of crude oil or kerosene were poured on the water in the flooded sawahs and the hoppers shaken off the paddy into the oil by means of long bamboos. Many swarms were wiped out by this method. A large number of breeding-grounds were reported from Malay kabuns and estates. Wherever it is possible to flood a tending-ground, this is the most effective way of destroying the unlatched locusts. A note is made of the necessity of notifying an Inspecting Officer of the presence of locusts on any land as stated in Section 13 of "The Agricultural Pests Enactment, 1913." Only by thorough co-operation of all the planting community will it be possible make a success of the present locust campaign. Rewards are still Agred for reporting breeding-grounds, swarms of first instar hoppers and swarms of 2nd to 5th instars. The report closes with a summary the locust destruction in Negri Sembilan in October and November, the totals collected being respectively 293 and 1,836 kerosene tins full . these insects.

Equesto il momento buono per combattere il pidocchio lanigero del melo.

[This is the proper time to combat the woolly apple aphis.]—

L'Umbria verde, Spoleto, iv, no. 1, Jan. 1914, pp. 10-11.

For winter treatment, a solution of 2 parts by weight of carbolised tobacco extract and a like quantity of carbonate of soda in 100 parts if water, or 1 part of soap and rather less than 1 part by weight of extoleum in 100 parts of water are recommended. The waxy covering have be brushed with a mixture of linseed oil 7 parts, white lead 1½ parts, zinc oxide 1 part, all by weight, which is boiled for 10 minutes, to which when cold is added 1 part of turpentine. A newly introduced method consists of burying calcium carbide, in pieces the size of a whunt, in holes made round the tree. If the soil be damp, the too rapid emeration of gas may be prevented by wrapping the carbide in paper.

FERMANA (E. F.). Come si combatte la fillossera. [How Phylloxera is combated.]—Consigliere dell' Agricoltore, Turin, ii, no. 1, 15th Jan. 1914, pp. 20-21.

If in spite of every care. Phylloxera has gained a footing in the vineiand, bisulphide of carbon may be used against it. A dose of 10 oz. It square yard will destroy, not only the pest, but also the vine, whereas the of it of oz. will destroy all, or nearly all, the pests without injuring deplant. In view of the fact that success is not quite certain and that the state of the fact that success is not quite certain and that the state of the fact that success is not quite certain and that the state of the fact that success is not quite certain and that the state of the fact that success is not quite certain and that the state of the fact that success is not quite certain and that the state of the fact that success is not quite certain and the state of the state COOLEY (R. A.). The Alfalfa Weevil.—Montana Agric. Expt. Sia Bozeman, Circ. 35, Jan. 1914, pp. 191-206. 7 figs, 2 pls.

The alfalfa weevil occurs in Europe, Western Asia and Northern Africa. The attention of the Utah Experiment Station was not called to it until 1907, but it has now spread over many counties in that State and the damage it causes may range from a loss of 25 per cent. to complete destruction of the crop. Early in the spring the hibernating adults emerge and in a few days lay eggs in holes, which they make in the stems of the alfalfa. While the stems are young the beetles feed on them, but when they are older and harder, the weevils feed on the softer epidermis of the stalks and leaves, and may completely defoliate the plants. The eggs hatch in from seven to sixteen days, and after about a month, pupation takes place; about two weeks later the perfect beetle appears. By about 1st August, the beetles have conpleted their feeding and have crawled or flown away, and for the most part, they pass the winter near the ground hidden in waste material ... buried in the ground. The so-called "spring flight" begins in April. about the 1st July is another period of great activity known as the "summer flight." It is advisable to stimulate the first crop to rate i growth by cultivation, so that it may be harvested just before the larvae would do their maximum damage. The removal of this first erop leaves a nearly bare field. Irrigation should be delayed and the field should be cultivated and brush-dragged.

In shipments examined before quarantine came into operation, weevils were found in three loads of potatoes, which contained 8, to and 12 living weevils respectively. There is now an Act to provide for the prevention of the introduction and spread of insect pests and diseases of horticultural and agricultural plants. Under this Act, on 12th September, 1913, the importation into Montana was prohibited of alfalfa hay, forage crops of all kinds, whether loose or baled, alfalfa seed and all nursery stock (unless accompanied by a certificate of funigation), and fresh fruit and vegetables of all kinds, during the months from April to October, inclusive, from the State of Utah, except that fruits and vegetables may be moved into Montana from Utah on and after 1st August of each year under special conditioner agarding packing. The quarantine is in force only during the season of the year when the adult weevils are active, and by this means to believed that the greater part of the danger of introducing this pear agreements.

removed.

Burgess (A. F.). The Gipsy Moth and the Brown-Tail Moth, with Suggestions for their Control.—Farmer's Bull. U.S. Dept. Agte. Washington, D.C., no. 564, 29th Jan. 1914, 24 pp., 10 fize [Recd. 14th April 1914.]

The gipsy moth feeds on apple, oak, grey birch, alder, willow, beech poplar, pines and other conifers, apple and oak having suffered most severely. These trees may be defoliated to such an extent as to cause their death. The brown-tail moth commonly feeds on apple, particular, oak and willow, and may be found on elm, maple and rose: it never attacks conifers and is seldom found on ash, hickory, chestnation birch. Natural enemies are proving very valuable in checking these

pests and parasites are now being imported into America. The enemies which are at present destroying the largest number of gipsy moth caterpillars and pupae, are a Calasoma beetle (C. sycophanta, L.), a Tachinid fly (Compsilura concinnata, Mg.), and Apanteles lacteicolor, Vier. Two species of egg-parasites imported from Japan, Schedius kwanae, How., and Anastatus bifasciatus, Fonse., are also proving of great value. These parasites and enemies, with the exception of the egg-parasites, also destroy the brown-tail moth. Meleorus versucolor, Wesm., attacks the latter, but not the gipsy moth.

Among the methods of control recommended for the brown-tail moth is the cutting off of the winter webs and burning them before the caterpillars begin to emerge in April. Spraying in the spring is not a satisfactory method since there is not sufficient foliage to hold the spray. The most effective measure is to spray the trees before the middle of August, using from 6 to 10 pounds of arsenate of lead to 100 callons of water. One of the best methods of controlling the gipsy moth is to treat the egg-clusters of the insect between 1st August and 1st April with creosote, to which a small amount of lampblack has been added. This mixture is applied with a brush. Burlap and tanglefoot bands are also recommended. The most effective spray for the gipsy moth is arsenate of lead paste applied to the foliage at the rate of 10 lb. to loo gallons of water, by means of a high power spray in the case of large shade trees. In orchards, early spraying will be sufficient where few egg-clusters are present, or where the infestation is more serious, a second spray in June will be found satisfactory. All poor or hollow trees should be removed, and if near an infested woodland, the trees should be banded with tanglefoot. In cities and towns the same methods can be used, but they will not satisfactorily control the gipsy woth in woodland areas. The treatment of such areas is made more difficult by the fact that they are composed for the most part of several species of trees. Sometimes practical methods of thinning can be adopted so that those species will be left that are only slightly subject to mjury by these insects; but the protection of woodland is a problem seeding much study and investigation. The damage caused by the brown-tail moth is ordinarily not so severe as that resulting from opsy-moth infestation, and elimination of oak, scrub-apple, and wild therry trees greatly assists in reducing the numbers of this pest. Each of the New England States is carrying on work for the control of these assects, a State official being in charge. A brief summary of the conshions of infestation in each State is given with a statement of any pecial lines of work that are being attempted. The work carried on by the Bureau of Entomology of the United States is designed to check the spread of these insects, and in order to obtain better methods of control the programme includes a thorough study of the food-plants, the feeding habits in the various stages, the rate of increase in the field, the means by which the insects are spread, the introduction and distribution of foreign parasites and natural enemies, and a study of the wilt disease. Silvicultural investigations and scouting work are being carried on to a large extent and this serves to establish the marantine line. Various parasites have been liberated in all the New England States, and records show that the control work is meeting with a large amount of success.

Contra el bicho moro. [Control of the black (Meloid) beetle.]-Guceta Rural, Buenos Aires, vii, no, 78, Jan. 1914, p. 525.

This insect belongs to the family Meloidae and is ½ to % of an inch in length, with a blackish conical body, covered with light grey pubescence. The perfect insect feeds on the leaves of the potato, tomato, and other solanaceous plants and devours them with such voracity as to strip the fields in a few days. The female oviposits on the ground and the primary larvae emerge in 20 or 25 days. These larvae are active and move about in search of food. When full fed they assume the second sedentary form, their shape altering as they approach the pseudochrysalis stage, in which they pass the winter. From this pseudochrysalis another larva emerges in spring and pupates in a few days, the imago emerging after an interval of 8 days.

The destruction of the beetle may be effected in various ways. The rown of attacked plants may be gone over with a large broad tray into which the insects may be shaken from the plants. This must be done early in the morning and is not much more costly than the use of arsenic, if suitable labour is cheap. The second method is to spray with Bordeaux mixture or other cupric solution. The applications must be made immediately the first insects appear. The addition of 1 part of lysol to 1,000 parts of the mixture is useful. The third method is the employment of copper arsenate in liquid form, 4 oz. being dissolved in 22 gals, water. If of cheap quality, the quantity may be increased up to 8 oz.

MURANIA (G.). Bianca rossa (Chrysomphalus dictyospermi vat. rinnulifera, Mask.).—Rinnovamento economico-agrario, Trapani, viii, no. 1, Jan. 1914, pp. 7-9.

The author states that the Agricultural Station at Messina has worked out the cost of lime-sulphur for each citrus tree at just under 3 pence for winter treatment and a little less for spring treatment. In the United States, hydrocyanic acid fumigation is practised at a cost of 20 pence per tree, each tree bringing in a net revenue of over 15 shillings. Spraying with lime-sulphur is only of use when the larvaere naked, as the adults have a thick skin which protects them from it. A simple guide is provided by a bottle in which some attacked twistor leaves are placed in January, May, or August, and daily examined by transmitted light until minute insects are seen wandering on the sides. The appearance of these larvae indicates that the favourable moment for operating has been reached. Of the enemies introduced for control purposes, the Coccinellid beetles, Chilocorus kuvanae and Rhizobius lophantae, seem efficacious.

ZIMMERMAN (H.). Einige Beobachtungen über die Johannisbeergalimilbe (Eriophyes (Phytoptus) ribis, Westwood) an Ribes alpinum in Mecklenburg. [Observations on the currant gall-mite in Mecklenburg.]—Archiv. des Ver. der Freunde der Naturgeschichte in Mecklenburg, Rostock, lxvii, pt. 1, 1913, pp. 130-136.

The currant gall-mite (*Eriophyes ribis*) is a pest of currants (*Ribes rubrum* and *R. nigrum*) of widespread distribution, and occurs in the neighbourhood of Rostock, Mecklenburg, on *Ribes alpinum*. Eggs are laid

from January onward, and the young mites appear in March. Among the enemies of this mite are Coccinellid larvae, particularly those of texcinella septempunctata, the hymenopterous parasite Tetrastichus erwiphyes, and the fungus, Botrytis cinerea. If the infestation is slight the buds which are attacked may be removed and burned in December and onwards; if the infestation is great, the whole bush should be burned. Collinge recommends dusting the bushes with a mixture of 1 part time and three parts sulphur; the dusting should be done at the end of March or beginning of April and should be repeated at intervals.

TURREL (A.). Les Traitements Arsenicaux en Agriculture. [Arsenical Treatment in Agriculture.]—Rev. Vitic., Paris, xli, no. 1051, 5th Feb. 1914, pp. 150-152.

The author disputes the idea brought forward by M. Cazeneuve, that araenical treatments are of little value in agriculture. On investigating cases where such treatments have apparently failed, it has been found that either the application has been badly made, or else at the wrong time. Where the application has been made with care, the results have been quite satisfactory. The author has treated 500 acres of vines with arsenates with complete success. The loss was only about 10 per cent., whilst in the neighbouring vineyards 66 per cent. of the harvest was lost. This has been his experience for about three years. In Bouquignau (Aude), Clysia ambiguella destroyed about 16 per cent. of the fruit just before gathering, but the following year by use of arsenates, the author was able to save it completely. Arsenical treatments prepared and applied according to the methods recommended by authorities, are of the greatest value to agriculturists, and if the necessary precautions are taken, no danger is involved in their income.

Ceplow pygmaeus attacking Cereals in North Africa.—Bull. Soc. Nat. Acclimat., Paris, lxi, no. 4, 5th Feb. 1914, pp. 122-123.

M. Rivière complained of the rapid multiplication of a sawfly, Cephus pagnaeus, which causes great damage in North Africa. The female perces the stem of any cereal and deposits an egg in the hole. This process is repeated fifteen to twenty times. The larva emerges very con and rapidly bores its way into the middle of the stem, in the lower part of which it winters as a pupa. After the crop has been cut, the stable should be burnt, thus destroying numerous pupae. The question whether C. pygmaeus can maintain itself on wild grasses requires investigation.

HUSGUNENQ (L.). La bouillie sulfo-calcique. [Lime-sulphur mixture.]

-Progrès Agric. et Vitic., Montpellier, xxxi. no. 6, 8th Feb. 1914,
pp. 186-188.

The author points out the difficulties in the preparation of lime-miphur for a good spray and subscribes to a suggestion of L. Degrully, that a simple way of attaining this end is to replace the lime-sulphur by the alkaline polysulphides produced commercially. He holds that where lime-sulphur is efficacious—as it must be when properly prepared—the alkaline polysulphides will be no less so. Like the lime-

sulphur mixture, which is only an undefined polysulphide of calcium with sulphurous and sulphhydric compounds, the alkaline polysulphides soluble in 2 parts of water act by their causticity and by the sulphur they deposit on the affected parts. This sulphur is extremely active, as it is in a nascent state. The polysulphide in concentrated (20-25 per cent.) solution keeps almost indefinitely. It only requires diluting with water to yield solutions of 1, 2 or 5 per cent. as required at the very moment of application. The author questions whether it is worth while carrying out delicate operations to obtain an unstable and even dangerous product, when the commercial article is of constant quality and needs nothing more than dilution for use.

BORODIN (D.). Работы по борьбъ со вредителями и бользиями садовъ въ Мартъ. [Control measure to be taken against pests and diseases of orchards in March.]—«Хуторянинъ» [Chulorianin], Poltava, 26th March 1914, pp. 333-336, 2 figs.

The author calls the attention of Russian fruit-growers to the neces sary preventive measures which must be applied in their orchards during March. He first recommends the destruction of various wintering pests, such as caterpillars of Aporia crataegi, Enprod. chrysorrhoea and Cydia pomonella, and the eggs of Rhynchites, Mali: cosoma neustria, Lymantria dispar and others. He figures the nests in which the caterpillars of Aporia crataegi winter and the lines of eggs of M. neustria, and gives in every case information as to how to get rid of the pests. He suggests also the removal and destruction of all withered fruit, which has been left on the trees, as this fosters various fungus diseases, Monilia etc. As a protection against scale-insects, he recommends smearing over the attacked parts with California mixture, [see this Review, Ser. A. ii, pp. 209-10] and with carbolineum. which latter however can only be applied to trunks and thick branches for the thin branches and shoots are injured by it. He remarks that Scalecide and some other remedies against scale-insects have not ver been tested sufficiently.

Rept. Dept. Agric. Union of S. Africa, 1st Jan. 1912 to 31st March 1913, Cape Town, 1913. [Received 25th Feb. 1914.]

Aspidiotus hederae appeared again on one or two olive trees and the apple and pear trees will have to be treated with lime-sulphir wach next winter for greedy scale (Aspidiotus rapax). Olive big has been less abundant, but has necessitated spraying with McDougall's dip at least once a month. Fruit fly was in evidence, but was kept well in hand with arsenate of lead spray. Among the specimens of one pests sent in for diagnosis, Dr. Perold found Phylloxera and mealy bar Mr. C. W. Mally, the Cape Province Entomologist, reports on the olive fly parasites. During May and June five lots of olives, presunably infected by maggots of the olive fly, Dacus oleae, were sent to Dr. F. Silvestri at Portici, Italy, for the purpose of establishing the South African parasites of this fly in Italy. The results appeared to be negative. Also during April, May, June and July nine lots of black scale (Saissetia oleae) were sent to California in order to establish the South African parasites of this scale-insect in America.

Australian Bug (Icerya purchasi) caused considerable trouble at Orchard siding, especially on Winter Nelis pear trees. Although several colonies of Vedalia cardinalis were distributed there, they seemed of butle value, and the trees were sprayed during the first week in July with Scalecide. Examination later on in the month showed that the strongest spray (1:16) did not completely penetrate the egg-masses, except those that received the full force of the spray. This suggested the idea of "progressive penetration," but this was found to injure the buds and twigs. The Buchu beetle, Ablabera hottentota, was the subject of serious complaint during August, owing to its depredations on young buchu seedlings near Piquetberg. Owing to their continually coming in from the yeld and the small size of the seedlings, spraying was considered useless, and therefore every plant was protected by a small cap of wire guaze. At Stellenbosch the strawberry ground beetle did serious damage by eating into the half-grown to fully ripe berries. There were hundreds of larvae and pupae in the soil and it was proposed to try and poison the beetles by means of poisoned bait. strawberry plants were also attacked by the strawberry weevil (Eremness) the larvae of which fed on the underside of the leaves. A spray of 1 lb, arsenate of lead in 25 gallons of water gave good results. This meet is also known to have other food-plants besides the strawberry, since they were found on matted grass and on old weed roots. The maize stalk-borer (Sesamia fusca), was the subject of an inquiry, but the greatest loss in this case was found to be due to a beetle (Heteranachus arator), cutworms and vellow stalk-borer (Sesamia-vuteria). thermychus especially proved a serious pest; toads and birds were found to devour them, but arrangements were made to try poisoning the heetles with bait. The lucerne Tylenchus has been at work for three or four years, but the lucerne holds its own, for the worm disappears as the hot weather approaches. The grain bug (Blissus diplopterus, Dist.) was very abundant in the wheat lands in the Piquetberg district during the last week in August, but disappeared after some heavy rains. A weak arsenical sweet was recommended for as against the Argentine ant (Iridomyrmex localis) and seemed to prevent this insect being a nuisance, but it increased rapidly as soon as the laving of the poisoned sweet was stopped. The grape-bunch spider also proved a nuisance to one grower. He had been handcleaning the bunches and no better measure could be suggested. If lumigation for vine mealy bug during the winter months proves a success, it may also destroy the winter stage of this spider. The pernicious scale (Aspidiotus perniciosus) has not vet been found in this Province.

A report is also made on nursery inspection, and it is stated that a large increase in this work has taken place. The Union legislation, in respect of traffic in plants, admits of much more effective control over nurseries than was practicable under any of the colonial laws. In the period under review 368 nurseries were registered. No nursery is known to be infested with San José scale. Of the pests on account of which quarantines would be imposed, the red scale (Chrysomphalus aranntii) is by far the most widespread, and no nursery with citrus stock was found to be absolutely free from this pest. The purple (Lepidosaphes beckii) and mussel scales are bad pests in some parts of the country. The former species most unfortunately has become

common as a palm pest. The Ross scale (Chrysomphalus rossi) has even greater potentialities as a pest and much trouble is being experienced in the prevention of its spread. Hedge plants are especially attacked by it and it is feared that this pest will attack the magnificent stretches of Australian myrtle (Leptospermum). The nursery control service is also endeavouring to hold back the pustular scale of the oak (Asterolecanium variolosum). The chaff scale (Parlatoria pergandu) and Aspidiotus dictyospermi are other potential pests found during nursery inspection. Twenty-seven nurseries were quarantined during the financial year 1912-1913.

References are also made to the plant and potato import regulations. Few of the plants imported during the period under review were found to be infested with pests. However Lepidosaphes ulmi (oyster-shell scale) was found a few times, and once in considerable numbers, and a gross infestation by Aulacaspis rosae (rose scale) was found on some blackberry plants consigned to a nursery. Neither of these scales is known to occur anywhere in South Africa. Among the fruit inspected. San José scale was in abundance on some Californian pears. During this period the sorting of imported potatoes has been supplanted by fumigation in formaldehyde gas. The chambers at Cape Town were made 14 feet square and 8 feet high, and the cases were stacked three or four high, with about three inches of clear space all round them. The chambers were built with two wide doors one opposite the other and the charge of chemicals divided between two buckets. The charge consisted of 48 fluid oz. formaldehyde solution (nominally 40 per cent.) and 24 avoir. oz. of permanganate of potash crystals. The crystals were placed in the bucket and the liquid added. In about half the treatments, the exposure was overnight and the rest was generally four to five hours. No injuries to the potatoes were experienced by this treatment. No contraventions of serious importance of the "Codling moth Regulations" have been reported. As a result of the "Plant Removal Regulations", two rather large consignments of oak trees, infested with the pustular oak scale, were prevented from being despatched from Johannesburg to distant centres, and the finding of the ordinary red scale on fruit trees, roses and vines was of common occurrence. A detailed statement of the occurrence of San José scale is given, and precautionary measures are being taken to check the dissemination of this pest. Migratory locusts gave no material trouble in any part of South Africa during the period covered by this report.

YOTHERS (M. A.). The peach twig-borer. An Important Enemy of Stone Fruits.—Washington State Agric, Expt. Sta., Pullman, Bull. no. 61, 10th Feb. 1914, 4 pp., 5 figs.

Known in the United States since 1860, when it was introduced with the peach from Western Asia, the peach twig-borer or peach worm. Anarsia lineatella, Z. causes considerable damage not only to the peach but to other stone fruit, such as prunes, apricots, nectarines, plums and almonds. The larvae hibernate in small silk-lined cells just beneath the surface of the bark, and located within the forks of small twigs. About the time the peach trees bloom in the spring, the young larvar emerge and, after a couple of days, eat their way into the tips of the

twigs. They not only eat the buds, but penetrate into the pith of the small twigs, causing the leaves to wilt and droop. One larva injures several twigs, and if infestation be severe, the tree may be killed. The second and third broods of larvae attack the fruit; they sometimes feed entirely in the flesh of the fruit, but often enter the stone. The pupal stage of the first brood is passed in crevices of the bark on the runk of the trees, or under rubbish on the ground, etc. The adult is a tiny grey moth. The second and third broods of larvae pupate mostly in the creases at the stem end of the fruit. The eggs of the first brood are laid on the base of the petioles or stems of the leaves, those of the second on the fruit, while those of the third are laid in the crevices of the bark in the forks of new and old growth.

This pest is subject to control at least twice in its seasonal life. It can be reached by a contact spray while in its cell beneath the bark, and it can be killed by a stomach poison when it begins feeding upon the leaf bud in the spring. The contact poison should be applied just before the buds swell in the spring. The later the application is made before the buds open the better. Spraying for the San José scale will also control the twig-borer, if started as late as possible when the buds begin to swell. Thoroughly applied lime-sulphur solution is considered to be the best treatment for the twig-borer. Crude oil emulsion has not been tested thoroughly against it, but in view of the perfect results obtained with this preparation against the San José scale, it appears to be a very promising remedy for the borer. Kerosene emulsion has been supplanted by lime-sulphur. Lead arsenate (1 lb. in 50 gals. water) is effective when the over-wintering larvae begin feeding on the young buds in spring, but as the buds grow quickly, the poison is effective for only a few days, after which it must be renewed. Many of the larvae and pupae can be caught by banding the trunks as for the codling moth, and the bands should be examined weekly during the sason. In the author's opinion, where regular spraying for the San José scale (either with lime-sulphur or crude oil emulsion) is practised each year as stated above, the injury of the peach twig-borer will be reduced to a minimum and further treatment usually unnecessary.

MAISONNEUVE (P.). Le Froid et les Insectes Parasites de la Vigne, [Cold and Insect Pests of the Vine.]—Rev. Vilic., Paris, xli, 12th Feb. 1914, pp. 179-182.

Numerous observations have proved that many insects can resist intense cold, and Clysia ambiguella and Polychrosis botrana are capable of resisting very low temperatures. It seems as if warm wet winters are more detrimental to these insects, for under these conditions, fungi develop and attack the pupae. Decortication is carried out in some vineyards and by this means many pupae are destroyed, but owing to the unprotected condition of the vines during winter, a great loss often results from this measure.

MORRIS (O. M.), HALL (J. G.), & YOTHERS (M. A.). Potato-growing in Washington.—Washington State Agric. Expt. Sta., Pullman, Popular Bull., no. 62, 15th Feb. 1914, 39 pp., 18 figs.

Of the insects affecting potatoes in Washington, the potato flea-

beetle was one of the most serious pests in 1913, not only on account of the direct injury caused, but because that injury affords a point of entrance to the fungous disease of the potato, known as early blight The most effective treatment for this insect is to spray the plants with Bordeaux mixture. The latter serves merely as a repellant. Wire worms primarily infest grass, but are not adverse to feeding upon potato tubers and often do considerable damage by boring through them. The best method of control, so far devised, is autumn ploughing to destroy the over wintering pupae in their cells in the ground. Cut worms are not especially fond of potatoes, but often do considerable damage. No method seems to give perfect control results, but clean culture is one of the most effective remedies and if consistently followed will give a good measure of success. A very common and effective treatment is to poison the worms with the poisoned bran mash reconmended for grasshoppers. Several species of grasshoppers injurthe potato by destroying its leaves and stem. In certain districts along the Columbia and Snake Rivers, there was a most serious outbreak of this pest in 1913. Fortunately the early potato crop was well advanced by the time the insects swarmed into the fields and gardens but in many cases the late potatoes suffered severely. Where grass hoppers are already in the fields, orchards and gardens, the best method is to kill them with a poisoned bran mash, one formula being: Bran 25 lb., syrup 1 gal., Paris green 2 lb. The Colorado potato beetle was found quite commonly in many parts of Eastern Washington during the summer of 1913, thus being, at last, established in the State, Both Paris green and lead arsenate are effective poisons, the latter being perhaps preferable. Another introduction of recent years is the potato tuber moth, or potato worm, which, for several years, has been the worst potato pest in California. With this, as indeed with most other pests, clean culture is a most important method of control.

GIRODAY (B. de la). L'Artichaut dans la Gironde. [The Artichoke in the Gironde.] La Vie Agric. Rur., Paris, iii, no. 12, 21st Feb. 1914, pp. 331-335.

In this article the author gives an account of the intensive production of the artichoke in Gironde, describing the varieties grown and methodof cultivation. In a paragraph on the natural enemies of this crop the author notes that the larvae of a Vanessa butterfly |doubtless Pyrameis cardui | invade the fields of artichokes in great numbers and entirely devour the leaves and fruit. Tobacco decoctions are of value in protecting the young plants, but cannot be used for older plants, since they impart to the fruit the odour of tobacco, rendering them useless for food. This pest disappears in a few weeks and several years may pass without any further attacks. The green Cassid beetle. though it does not cause such serious damage as the butterfly, renews its attack every year. The larvae are very resistant to insecticides and the adults eat the leaves of the plants and greatly reduce their value. Since the eggs are laid early, it is possible to treat with nicotin before the plants have developed much. The ravages of this pest are checked by the rains, whilst very warm dry periods are favourable to it.

GRAF (J. E.). A Preliminary Report on the Sugar-Beet Wireworm, Bar. Entom. U.S. Dept. Agric., Washington, D.C., Bull., no. 123, 28th Feb. 1914, 68 pp., 23 pls., 9 figs.

The sugar-beet wireworm, (Limonius californicus, Mannh.), has been a more or less destructive pest on sugar-beets since they were first grown n California, and prior to that time was known as an alfalfa and maize ast it may be considered the worst insect enemy of the sugar-beet, cause it is constant, appearing every year to a greater or less extent, and its injury occurs in such a manner that replanting is generally appractiable. The beet is killed, since the wireworm cuts into and injures the root. This insect is most injurious while the beets are young and is structive only in the larval stage. Other beetles occur with the gar beet wireworm, e.g., Drasterius licens, Lec., Cardiophorus aeneus, Horn, and C. crinitus (!); Platynus sp. has been commonly noted and La Blapstinus sp. and a species of Coniontis. Among the food-plants scorded, the larvae have been noted on wild beet, potato, Lima bean all varieties), maize (all varieties), Johnson grass (Sorghum halepense), deck (Rumex hymenosepalus), alfalfa (Medicago spp.), pigweed (Amaranis retroflexus), nettle, wild aster and Mustard (Brassica niger). oviposition takes place during the spring, mostly in April; a loose damp soil is selected and nearly all the eggs are placed in the top inch and a half of soil. A small mite Parasitus (Gamasus) colcoptratorum, L, was commonly observed with the eggs. Each female may deposit about 100 eggs, and these hatch in about 15 to 25 days. The exact ragth of the larval stage is not known, but from experiments it seems that it could not be less than three years. After emerging from libernation the wireworms feed on the old beets until they can obtain young beets. The pupal stage lasts for about a month. Old heetroots are the favourite food, and the larvae are only occasionally found at the roots of alfalfa, Johnson grass, wild beets and young beets. In the experiments recorded, none of the beetles were very active after 15 lays, and after 25 days they became very feeble. Under field conditess 75° F. to 80° F. seems to be the optimum temperature for their various activities, and most adults show remarkable ability to withand physical injuries or sudden and unfavourable climatic conditions, such as great changes in temperature and several severe rainsforms a succession. They pass the severest part of the winter in the soil and the time of their appearance in the spring is influenced to a large extent by artificial agencies such as spring ploughing. Thus prematurely driven to the surface, they seek "secondary hibernation" ader almost any shelter. On becoming active they remain relatively near the hibernating quarters, but are disseminated by the occurrence strong winds and floods.

The wireworms have several important natural checks. Nearly ill insectivorous birds eat them, and the Carabids or ground-beetles, dispose of large numbers. The adults are also at times severely stacked by a fungous disease. No efficient parasite has yet been found for this pest, though a bacterial disease is often present. On the whole, the larvae of *L. californicus* are very little affected by their animal enemies, or by fungous or bacterial diseases.

Experiments were made to test remedies for the sugar-beet wirerorms. Those depending upon the use of poisoned bait were far from satisfactory-the wireworms showing little ill effect from eating the bait. The poisons used were lead chromate, potassium evanide strychnine, Paris green, lead arsenate and zinc arsenite A fairly exhaustive series of experiments was carried on, using 19 repelled. substances against the larvae. None however gave results which would justify recommending them as a deterrent. In one case the land was dressed with a solution of potassium cyanide. By this method the cyanide is used sparingly and its killing power was very good, but it remains to be seen whether a suitable strength of cyangle can be found which will kill the wireworms, without harming the beets The destruction of the pupae by cultivation has been recommended but in order to be effective, the autumn ploughing would have to be quite deep (9 to 10 inches). Experiments with guano fertilizer show that it would be impracticable for ordinary use. No doubt much is the injury to the beets may be avoided by early planting, as this gives the roots a good start before the wireworms are doing their near extensive feeding. Clean culture against the adults, by compelled them to seek shelter elsewhere and exposing them to the attacks of their bird enemies, seems to be the most practical remedy found thesfar for this insect. Old beet tops are left to act as a fertilizer and are supposed to be ploughed under, but by the time the land has been harrowed several times many appear on the surface again. All old tops should be cleared away, and the efficiency of this remedy would in increased if autumn ploughing and early planting were combined with

BAGRINOVSKY (--). О борьбьсь вредными насъкомыми въ Нуликовскомъ льсничествь Тамбовской губерніи за 1913 годь. [The fight against injurious insects in the Kulikov Forest of the Government of Tambov in 1913.] — «Льсная низнь и Хозяйство.» [Forestry life and Economy], Tambov, no. 6, March 1914, pp. 6-10.

Melolontha adults were not abundant in 1913, and owing to spinst frosts, very few emerged until the middle of May. The collection of beetles organised in the Forests which lasted till the 20th May, produced over half a ton of beetles, which, it is calculated, contained 335.266 females. A table showing the amount of beetles collected daily is given. The premium paid for the collections was at first about 14. per lb., but owing to the small number of beetles, it was found necessarv to increase this figure to about 13d. The total cost of collection. in which some 130 people, mostly women, were employed, was £8 16. The work was done principally between 10-11 a.m. although some women collected the whole day; the area over which the collections were conducted was not more than 6,750-8,100 acres. Other purposes necessitated an expense of £3 12s., so that the total cost of the campaign was £12 8s. Judging by digging operations, undertaken to ascertain the prospects of the numbers of adults in 1914, even less than in 1913 may be expected, as nearly all the larvae found were of the first and second year, only occasional specimens of three-year old larvae being observed.

An experiment has been started to ascertain the amount of damage done by the larvae to trees of various ages, and the ability of the trees to withstand the damage; four pines and one oak were surrounded in antumn with a trench and about 1000 larvae were brought into the enclosure and left there.

A flight experiment was also undertaken by Prof. I. K. Tarnani; about 1,000 beetles were marked with anilin blue and black varnish and released in a field 2-21 miles away from the forest; but no marked justles were found amongst those collected. The experiment was repeated by V. P. Shugaiev with inconclusive results.

The sollected beetles were dried either in a seed drying room, where they perished rapidly from the high temperature, or in a special oven, and they were afterwards ground to powder in a special mill. Samples of this powder were sent to Professor Tarnani of Novo-Alexandria for analysis, in order to ascertain whether it can be used as manure.

Trenching of the ground was undertaken to ascertain the results if the collection of the adults upon the numbers of the larvae in the the good results of these operations will appear in the report of Professor Tarnani. During the work, some diseased larvae were found and sent to the Phytopathological Bureau of St. Petersburg, and in one case, the infection of the larva with Botrytis bassiana. Bos., was ablished.

R: THERFORD (A.). Some Notes on Xyleborus fornicatus, Eichh., (Shot-Trop. Agric., Peradeniga, xlii, no. 2. Feb. 1914, Hole Borer). ър. 220-222.

In this paper the author records several experiments he has made ath a view to determining whether, in burying prunings as a control and Ayleborus fornicatus, Eichh., the beetles are killed or are unable to reach the surface of the soil. Infested twigs were first kept under decryation, and from these it was found that the proportion of males to females is one to five and in a larger count, 1 to 12:25. In each calery in the twig the number of immature insects is from 6 to 10 in a vigorous colony, or may be as high as 17 or 18. Experiments were and made regarding the method of control. In the first place several teetles were placed in a glass jar and covered with earth to a depth of the inches: this was found to present no formidable barrier to their emergence. In other experiments infested twigs of tea were placed in two cylinders and covered with 7 and 51 inches of soil respectively. After 30 days, the contents were examined, the twigs showed a growth white fungus and below the bark, the wood was almost black. Feetles were still present and thriving, though some had been observed the surface of the soil and probably some had escaped through beles eaten in the muslin cover. On 30th October twigs were buried ha similar manner with slaked lime. No beetles had been seen by th November, but when the twigs were examined, living beetles and arvae were found. Some of the twigs were left in the cylinders, and was found that slaked lime had failed to kill the larvae after an Aposure to it of 23 days. Quicklime was next used, but, as with the saked lime, the beetles, under laboratory conditions, continued to ined in prunings that were far gone in decay, provided these are not dry, and were able to work up through as much as 71 inches of

fine earth mixed with the lime. It was also found that in prunit a left on the surface of the ground for as many as 13 days, adults and even pupae may remain al.ve. Dipterous puparia and larvae are het infrequently found in the tunnels of X. fornicatus, but even if the prey on the shot-hole borers, the extent to which they do so is practically negligible; beetles and their larvae and their eggs have been found in many galleries that contained maggots. It is clear that the maggot is an unwelcome tenant of the gallery, but it may merely ear the fungus which forms the food of the beetle and thus serve to diministhe number of beetles reaching maturity. Other insects have been encountered on rare occasions in the tunnels. In the light of present knowledge, the means of control recommended are, the burner, of prunings, discovery and elimination of breeding grounds in plant. other than tea, cultivation and manuring, and prevention of the infectation of fresh areas. X. fornicatus is now known to occur in mater localities in Ceylon, a list of which is given.

RETHERFORD (A.). Tea and Citrus Mites. Trop., Agric. Peradence: xlii, no. 3, March 1914, pp. 225-229.

The author in this paper records the occurrence in various locale, -of the following mites, Brevipalpus obovatus, Donn, Tetranegia bioculatus, Wood Mason, and T. mytiluspidis, Riley, and gives a describe tion of them. B. oboratus is a common and widely distributed proof tea. The mite lives in colonies on the under surface of the leaf and Green has recorded cases in which whole bushes have been almost denuded of leaves and even killed as a result of the work of this pos-Under the name of Tennipalpus californicus, Banks describes a take bearing a striking resemblance to B. obovatus which occurred in Calfornia. The author has also observed B. obovatus on citrus tree-T. bioculatus attacks chiefly the upper surface of the leaves, but does not prove so injurious in Cevlon as the other mites of tea. Greek records this mite from Camphor and Grevillea, and the author he seen it on Eugenia jambos. The author has recently found on Citys in Cevlon, the Citrus Red Spider (T. mytiluspidis, Riley) of California It was first described from orange in Florida in 1885, and is capable of doing considerable injury.

HEWITT (C. G.). The Protection of Birds in and around Ottawa. Ottawa Naturalist, Ottawa, xxvii, no. 12, March 1914, pp. 161-177 2 figs.

After drawing attention to the enormous amount of damage derection crops, etc., by insects, the author gives some account of way in what birds may be used as a controlling factor and adduces figures to she at that the work they may do, in destroying insects, is very considerable insects constitute 65 per cent. of the total yearly food of woodpeckers 96 per cent. of that of fly-catchers, and 95 per cent. of that of wrong Upwards of 5,000 insects have been found in the stomach of a single bird. The value of the birds is increased by the fact that, at the turn when insects are most abundant, birds are most active and requirement food, especially animal food, to feed their young; a pair of use and their young will consume about 170 pounds of insects during a year.

The American robin (Planesticus migratorius) probably appears arbest in the year; its food consists largely of cutworms. The blue and stadia sialis) is not so common in the Ottawa district; insects, said as grasshoppers, beetles, and caterpillars, constitute about 68 of cent. of its food. Wrens, such as the house wren (Troglodytes day, chicadees (Penthestes utricapillus and others), martins (Proque its and others), the tree swallow (Iridoproche bicolor), two of the archivekers (Colaptes auratus and Dryobates pubescens), etc., are taily attracted by nesting boxes, of which various forms are destined. Such boxes are not costly, and experience has shown that they the tosolve the problem of destroying various pests.

Research, Washington, i, no. 6, March 1914, pp. 471-474, 2 pl.

The fly Agramyza pruinosa belongs to a family of leaf and stem sters, but is remarkable in that it mines in the cambium; the mine aver a sear known as the "pith-ray fleck," and on birch trees in rappe it is the work of A. carbonaria. A. pruinosa has been reared from birch trees in America, and similar, if not identical, species have sen found on red maple (Acer rubrum) and wild cherry. The trees maked are outwardly healthy, and the damage can only be seen on young the cambium, which shows the galleries made by the insect. Larvae, kept in jars containing earth and sand, emerged as adults at send of April and the beginning of May. The larvae emerge from the roots and pupate in the earth. A hymenopterous parasite of the ser has been reared; this parasite, Sympha agromyzae, lays its egg the egg of the host; no sign that the host is parasitised is recognised until after pupation, when the parasite emerges from the pupal are of the dipteron.

KNM (F.). On the Genus Cryptochaetum.—Insec. Inscit. Menstrans, Washington. ii, no. 3, March 1914, pp. 33-36

The author revises the Cecidomyid genus Cryptochoetum, which is intertant in that it contains species which are parasitic on scale-rests and have been used in America for their control. The species witted to and described are Cryptochoetum iceryae, Williston, and amouphibit, Skuse, both formerly placed in the genus Lestophonus and parasitic on Iceryae purchasi, and C. curtipenne, sp. n., bred from the scale-insect Walkeriana (?) kandyense in Ceylon.

*ASWFORD (J. C.). Three New Hymenoptera (Chalcidoidea).—Insec. Insert. Menstruus, Washington, ii, no. 3, March 1914, pp. 36-38.

Three new species of Chalcid parasites are described: Pachyneuron summer, bred from codling moth at Rosewell, New Mexico; Cyrto-febr glasgowi, reared from puparia of Brachydeutera argentata at Thana, Illinois; and Pleurotropis testaceipes, from a leaf-miner on at another mined plant at Batesburg, S. Carolina.

Hood (D.). Two Porto Rican Thysanoptera from Sugar Cane.—Inoc. Inscit. Menstruus, Washington, ii, no. 3, March 1914, pp. 38-41, 1 fig.

Two species of thrips, Heliothrips femoralis, Reuter, and Haplothrips (?) tibialis, sp. n., are recorded as occurring on sugar-cane in Porto Rico they are both additions to the list of insects known to affect that plant as well as to the known Thysanopterous fauna of the island.

COCKERELL (T. O. A.). A New Coccid from Arizona. Entom. News. Philadelphia, xxv, no. 3, March 1914, p. 110.

A new species of Coccid is described under the name Palaeocrie... morrilli. It was taken on a plant resembling, though not identical with, Viborquia spinosa.

Forest Insect Ravages stopped.—Ind. Forester, Allahabad, xl. 60.3 March 1914, pp. 117. [Extract from American Forestry.]

By a prompt campaign against a colony of bark beetles (Scoly TIDAE) in the Ochoco National Forest in central Oregon, a danger who is threatened to destroy millions of feet of timber was eliminated. The combat this pest the usual method, recommended by the U.S. Bureautor and July, while the larvae are still in the tree: this is sufficient to is them and the timber may be sold while it is yet sound. In the Ocho-Forest there was no market, and the forest officers found that the cheapest and most effective method of control was to cut the trees at the burne the new broads of beetles could emerge. In 1912 the infestation was given a decided check by the cutting of 3,500 trees for 1913, 40,000 trees were cut, and as a result of these measures the beetles are under control.

Control Work against Forest Insect Depredations in the Hetch-Hetchy Watershed of the Yosemite National Park. Entom. News, Philiphia, xxv, no. 3, Mar. 1914, pp. 132-133.

Investigations have shown that as much as 95 per cent, of the timber in some of the canvons and valleys of the Tuolumne River, has been killed by bark-boring insects. This condition, affecting the scene beauty of the north of the Yosemite Valley and its consequent effect on the water supply and general economy of the Hetch Hetchy project presented an important problem, and arrangements were made to combat the beetles. Two acres were marked off, and on one, measures were taken during July, before the beetles would have begun to emetafrom the bark; the second area was treated in September and at the beginning of October, at the time when the beetles coming from the overwintered broods had entered the bark. The measures taken were to fell the infested trees, lop off the limbs, pile them on the trunks and set fire to the whole; this scorched or burned the bark sufficiently to kill the insects. The trees thus treated, 1,671 in all, ranged in diameter from 6 inches to 54 inches, the average being about 221 inches. The cost was about £240. It is estimated that a further outlay of about £100 will suffice to bring the beetle quite under control. The insect responsible for the death of such a large percentage of lodgepole pare

timber in the northern section of the park is the mountain pine beetle Dendroctonus monticolae). It attacks healthy trees and kills them by mining between the bark and wood so as to stop the movement of ap, which results in the death of the tree within 10-12 months after it gattacked.

InBLONGWSKY (J.). Recent Work of the Royal Entomological Station of Hungary .- Mthly. Bull. Agric. Intell. Plant. Dis., Rome, v, no. 3, March 1914, pp. 316-320.

In 1913, the most troublesome pest in Hungary was the corn ground betle (Zabrus tenebrioides, Goeze) which injures the cereals in autumn, attacking the seedlings, and if the winter be mild continues its gavages up to the beginning of May. Spraying, with an ordinary knapsack-sprayer, with a nicotin mixture made by dissolving 2 oz. d sulphate of nicotin and 11 lb. of soft soap in 10 gallons of water, ass effective in killing all the beetle larvae. Healthy, as well as stacked, plants should be treated and the earlier the spraying is done, the more effective is its action and the lower the cost. The cereal or variey leaf beetle (Lema melanopus) is a sporadic pest of barley and cats, attacking their leaves in the early spring, and causing the plants odry before the proper time and yield no seed. Catching the insects or means of nets and also destroying the larvae with a spray, were cand to be efficient methods of control. Spraying is more satisctory in dry weather, the formula given being, 4 lb. of nicotin sulphate and 15 lb. of soft soap to 100 gallons of water.

Other experiments were conducted on a larger scale, with sulphate I meetin, against the caterpillars of Clysia ambiguella and Polychrosis стана, which cause as much injury to vines in Hungary as elsewhere. yeavs containing 2 oz. of nicotin (either sulphate or extract) and 18. of soft soap to 10 gallons of water, or Dr. Jean Dufour's mixture composed of 12 lb, of pyrethrum powder and 3 lb, of soft soap to 10 colons of water, were used, and the experiments showed that 98 to oper cent. of the larvae were destroyed, provided that the following wittions were observed: -(1) that the control be commenced at most favourable moment for the hatching of the caterpillars (in Hongary in 1913 it was after May 24th); (2) that the spraying be and out under high pressure; (3) that the bunches be sprayed both sides: (4) that the solutions be composed of insecticidal thetanees (nicotin and pyrethrum) and of substances capable of removing fat (soap). Experiments were undertaken against the repullars of the grape moth (Oenophthira pilleriana); the best were obtained by a combination of hand-picking at the time alon the young shoots were beginning to be attacked, and a subseent spraying with Bordeaux mixture to which 1 lb. of lead arsenate vi been added to every 10 gallons of mixture; what the ultimate -ult of this method will be as regards efficiency is uncertain.

Ceckchafers (Polyphylla fullo) have caused much damage in vineands: hand-picking of the larvae was the method of control practised; insect has a preference for the Scots Pine (Pinus sylvestris), Corsican one (P. laricio), Austrian pine (P. austriaca) and black spruce (Piceu and these were introduced into the vineyards; the insects attracted by them, and are more easily collected from them, than from most other trees.

Work was done on the use of lime-sulphur mixture. In Spite 15 the fact that it is very effective against Lecanium, its adoption in Hungary is not likely to be very rapid, because (1) its preparation is lengthy; (2) it does not always succeed, on account of the varying nature of the different quicklimes of the country; (3) its preparation is not carried out on a large scale in Hungary, nor at a low preparation and (4) the practice of spraying fruit trees with carbolineum (15) of carbolineum to 10 gallons of water) is constantly gaining ground

PICARD (F.). A propos de l'action du froid sur les insectes. [Ti-action of cold on insects.] Progrès Agric. et Vitic., Montpelles xxxi, no. 11, 15th March 1914, pp. 332-333.

Insects may be divided into two classes, according to the manner in which they pass the winter. Some are in a latent state, either aleggs, larvae or puppe, while others lead an active existence and feed as they do in summer. This is the case with a dy Agromyza abiens, found in artichoke and cardoon gardens in the Some of France and which the author has been studying for some two Its larvae are very voracious and cause much damage, but about the middle of January last, when the temperature fell to 6 Fr., they practically all perishe for an examination led to the conclusion that therefore unable to resist rigorous temperatures.

The author remarks that "woolly bears" (the larvae of Arctia et al., will be less abundant this year than last, because nearly all weldestroyed last season by Empusa aulicue. On the other hand it very doubtful whether the fungus Beauveria globulifera, which require a mild and damp winter, will have been able to kill many of the visiblea-beetles (Haltica ampelophaga). A severe winter will thereforehave been harmful in this sense.

GIRAULT (A. A.). Hosts of Insect Egg-Parasites in Europe, Asia. Africa and Australasia, with a supplementary American List. Zeitschr. wissen. Insektenbiol., Berlin, x, no. 3, 15th March 1914, pp. 87-91.

A list is to be given, of which the present paper is the first part, of the insect hosts of egg-parasites as yet recorded from the arcoindicated, and the American list drawn up by the author (1907, 191) is supplemented. The present part includes nearly 80 species.

Zacher (F.). Papilios als Schädlinge der Agrumen. [Papilios as ett.: pests.] Entom. Zeitschr., Frankfurt a. M., xxvii, nos. 50.1. 14th & 21st March 1914, pp. 288-289, 295-296, 5 figs.

Few Papilios are of economic importance, but the caterpillars of these show a preference for the hard, shiny leaves of citrus trees throughout the world. The African Papilio demodocus, Esp., latering leaves on the underside of a leaf. Many eggs are laid to unsuitable plants, or even on dry wood, but always in the immediate vicinity of orange trees, so that the strong smell emanating from the latter is supposed by Vosseler to provoke oviposition. This special increases rapidly and does not appear to suffer from enemies and

parasites. Riley states that the North American P. cresphontes. which has the same habits, is avoided by nearly all birds. In India and Arabia, P. demoleus, L., is found in place of P. demodocus, Esp. In China and Japan the citrus-injuring Papilios are represented by P. ruthus, L., and P. demetrius, Cram., and in Australia by P. acous. la the Malay Archipelago P. memnon, L., is the species which attacks ctrus plants. P. polytes, L. (=pammon, L.), which is smaller than P memnon, is found in British India and the Sunda Islands. In Forida and Cuba, orange and other citrus-trees are attacked by the aterpillars of P. andraemon, Hb., and P. thons, L. The injury done to cirrus plants by Papilio caterpillars may amount to complete defoliation, with resultant loss of the crop. The collection by hand of caterpillars and pupae is advisable, but if the trees be too big or the plantation too extended, spraying may, exceptionally, become pressary. A solution of 1 lb. lead arsenate in 50 gals, water should be and care must be taken to stir the spray solution to prevent the poison from settling.

Vassiliew (I. V.). Вредители хлопчатника въ Ферганъ по наблюденіямъ 1913 года. [Pests of cotton in Fergana, according to observations made in 1913.] -Труды Бюро по Энтомологіи Ученаго Номитета Глав. Управ. 3. и 3. [Memoirs of the Bareva of Entomology of the Scientific Committee of the Central Board of Land Administration and Agriculture, 8t. Petersburg, x, to, 10, 1914, 23 pp., 13 figs.

The pests of cotton in Russian Central Asia and in Transcaspia are sal little known, notwithstanding the fact that the cultivation of sation in Turkestan is increasing from year to year. The author was and by the Bureau of Entomology of the Central Board of Land Abbinistration and Agriculture to study these pests and here gives the results of his observations in 1913 in Fergana, which province is ** principal cotton-growing district of Russian Turkestan. The Mowing pests were observed: Thrips flavus, Schr., is injurious to eston both in the adult and larval stages and was found as early as " middle of April, when the insects attack the first pair of leaves, essing smooth, shining, light spots of irregular form; such injuries we not as a rule fatal. When the first true leaves appear, the insects "ick them, chiefly at their base or near the main veins. This may the leaves to fall off, but, in some cases, the damage leads only deformation. The insects then move to the more developed leaves, at several individuals may be found at the base of each leaf, mostly the point where the main veins separate; the tissue of the leaves on the spots turns brown and withers. With good cultivation the effects deline damage are less noticeable. T. flavus is widespread in Fergana, In the middle of June, the proportion of injured plants on the The of the Agricultural Station in the Starvation Desert was 40 50 Frent. Sometimes these insects occupy leaves on which are colonies Tetranychus telarius, and these mites are evidently destroyed by Thrips, which establish themselves underneath the webs formed by the mites. T. flavus was also found by the author on Atriplex and plums. A solution of green soap was used as an insecticide against "Thrips, about 1 lb. of soap being dissolved in about 2.7 gallons of water. After the first spraying 40 per cent. of the insects perished: the second spraying raised this figure to 80 per cent.; the young plants which at the time of spraying (25th-26th June) had two or four true leaves, did not suffer from the insecticide.

Euxoa (Agrotis) segetum, Schiff., appeared at the same time on the cotton fields of the Station of Adijan. During the daytime the young larvae eat the parts of the plants below the surface of the soil, the larger individuals dragging other plants into their holes; at night they gnaw the cotyledons of the seedlings. These larvae also feed on certain weeds common on cotton plantations in Fergana, such as Convolvulus, Malva rotundifolia and Plantago; they also attack maize These larvae did considerable damage at Pachtalykulsk, to a new variety of cotton brought by A. N. Liubtchenko from America and sown for experimental purposes to obtain hybrids. The percentage of damaged crops on some fields was 80-90 per cent.

Aphis gossypii, Glov., appeared after the beginning of May. At first only small colonies of winged and wingless specimens were found but after June, the numbers grew rapidly. The progeny of winged individuals were of a yellowish or brownish-green colour and occupied the lower sides of the leaves; those of wingless parents were blackishbrown and rested mostly on the stalks and buds of the cotton plant, From the beginning of July the migration of the aphids began and then the injuries caused by them became obvious. The injuri plants had an unnatural, shining appearance. The author attributes to these insects the dropping off of the buds and young bolls, which is usually ascribed to the influence of dry winds or lack of water. The injuries caused by aphids also favoured the growth of a fungu-

(Capnodium) which develops on their excreta.

At the beginning of July, the author discovered on cotton son, predaceous insects which destroyed the lice, such as the larvae of Syrphus, Leucopis, Chrysopa, Coccinella 7-punctata, L., C. 18-punctata Scop., Adonia variegata, Goeze, and other species; also a Braconst of the genus Aphidius, which proved very effective in destroying the pests. About the middle of July some new enemies appearin the form of larvae of Aphidoletes and of Triphleps allowpennis, Reut., and a parasite, of the family PTEROMALIDAE, replaced the Braconid. Each female of Aphidius in captivity attacked only 3 to 4 aphids and infested only the wingless forms. The adult parasites lived for a week in captivity before ovipositing, being fed on hone; At the beginning of July the same aphids were also found on melosand pumpkins when these plants were situated near cotton fields. also on Hibiscus trionum, L., a weed belonging to the same family a colton. The activity of all the natural enemies effected a market decrease in the numbers of the lice, and by the middle of August it was difficult to discover specimens near Andijan, although round Skobelev small colonies existed even in September.

Besides A. gossypii, another aphid, which has just been described by Mordwilko and named Acyrthosyphon gossypii, Mordw., was found on cotton; it is similar to Aphis pisi, being distinguished from the amongst other characters, by its longer proboscis. The author first discovered small colonies of these aphids, consisting of wingless vivi parous females and larvae of various ages, on the 29th June near Andijan; a month later the numbers of this species were much greater

and the colonies contained winged and wingless forms and were found on the lower sides of leaves in company with A. gossypii, but there was so sign that they were injuring the plants.

Teranychus telarius, L., was first observed by the author on cotton seedlings on the 25th June, near Skobelev. A month afterwards the presence of this mite was more noticeable owing to the appearance of purple red spots on the leaves of the cotton. The colonies of T. durus usually appear on the lower sides of the leaves, living beneath web. The purple spots produced by them are chiefly peculiar to American varieties of cotton, e.g. Gossypium hirsutum, while the local ort. G. herbatium, does not exhibit them; this is explained by the presence of a red juice in the leaves of American cotton, the Russian cottons having a practically colourless juice. The local varieties are more liable to the attacks of this pest, loss of leaves occurring more frequently in their case. Occasionally there is an extraordinary growth of the colonies and the whole plant is then covered with the web. Amongst the enemies of T. telarius are mentioned: Scolothrus sexmaculatus, Pergande, larvae of Aphisoletes, larvae, nymphs and imagos of Thripleps albidipennis, Reut., and the larvae and imago A Segmnus punctillus, Ws.

As a remedy, the author has tried a solution of wheat paste; 1 lb, of wheat flour to 8 gallons of water, the flour being first made into paste in the usual way. He described his experiments with this remedy and with flowers of sulphur, and it appears that the former proved much more effective; it is cheaper, 3 gallons costing only about 4d., and kills the mites in a very short time (1½ to 2 hours), by smothering them; while the second remedy causes death only after a few days, cortain percentage of the mites escaping.

Accidium acgyptium, L., were discovered at the end of June in the areal stage on cotton leaves. The larvae, as well as the nymphs, field principally on cotton, while the imago feeds on the foliage of principally on cotton, while the imago feeds on the foliage of prishes and fruit trees. In captivity the emergence of the insects began on the 7th September, indicating that A. acgyptium winters in Fergana as an imago, which is also the case in the Crimea. In Andijan, to per cent, of the plants were sometimes injured. The same pests are also noticed in Pachtalykulsk and in the Starvation Desert.

At the end of July, injury to cotton by Pandemis (Tortrix) chonichlana, Hs., was first observed. The larva draws the leaf into a tube and skeletonises it, destroying as many as 3 to 4 leaves during its life; also attacks the buds. P. chondrillana has two broods during the

in July, damage to the leaves of cotton by Acronycta rumicis, L. var. transica, Staud.. was observed in Pachtalykulsk. The young larvae at away the parenchyma of the leaves, not touching the epidermis; after on they gnaw round holes through the leaves, leaving the main tens untouched. Such injuries were mostly observed on cotton proving near plantations of poplars or willows. Nearly all the larvae collected were infested by Anilasta sp.

Adelphocoris lineolatus, Goeze, was frequently found on cotton in Andijan, especially where the plantations of cotton joined lucerne helds. This pest sucks the pedicles, stalks and leaves of cotton, rausing in some cases the falling off of young bolls and buds. In aptivity it was observed to oviposit on stalks of cotton. Monostira

inermis, Horv., although not living on cotton, but on leaves of willows and poplars, finds its way on to cotton and sucks the leaves, causing small pale spots. This was observed in the Starvation Desert at the beginning of August.

In the middle of July, a peculiar injury to cotton was noticed near Andijan, consisting of numerous light irregular spots, concentrated chiefly near the tips of the leaves. This injury was caused by Chlorate bipunctata, which was also found on small-leaved elms. With a occurred Agallia sinuata, M. Rey, which usually sucked the stalks and petioles of cotton, without however causing noticeable damage. Both species produce two generations during the summer.

During July and August, the maggets of a fly, Agromyza flavelon, Fall., were observed mining the leaves of cotton near Andijan and Akobelev; the image appeared in the middle of August.

Single examples of Chloridea obsoleta, F., and Laphygma exigua, Hiswere also found by the author on cotton.

Sudetkin (G.). Озимый червь и борьба съ нимъ. [Евсков septom and the fight against it.] Reprint from «Ежегодникъ Бобровской Уваной Земской Управы.» [The Annual Report of the District-Zemstvo of Bobrov.] Bobrov (Gort. of Voronezh), 1911 6 pp., 4 figs.

The author, in a popular form, describes the imago and larvae of Euroa segetum, figuring both stages, and giving some general information as to its life-history and the injuries it does to crops. In the government of Voronezh, there are two generations, at the beginning of summer and in autumn. The larvae of the first generation injure "bachza" plants, beetroots and tobacco, while the second generation damages the seedlings of winter-sown grain. The author suggests as remedies: Trenches round the stripped patches of the fields, which may be made with a plough; poisoning the larvae by spraying with Paris green or by means of baits consisting of poisoned leaves of cabbage, beet, etc.; ramming the spots seriously injured, with heavy wooden rollers; ploughing deep in autumn and early in spring; collecting and destroying the larvae; destroying weeds, on which the imagines oviposit and which form the principal food of the vount larvae before the grain begins to sprout; catching the imagines in troughs with molasses.

Rossikov (K. N.). Занятый паръ, канъ предупредительная мѣра борьбы съ озимымъ червемъ или бабочками озимыми совками.

[Occupied fallow land as a preventive against Eurou (Agrelei segetum, Schifft, and Feltia (Agrotis) exclamationis, L.]. Труды Бюро по Энтомологіи Ученаго Номитета Глав. Управ. 3, и 3.—[Memoirs of the Burcan of Entomology of the Scientific Committee of the Central Board of Land Administration and Agricultur. St. Petersburg, x, no. 7, 1914, 15 pp., 1 map.

The author has studied the question of "occupied fallow land" as a means of preventing the multiplication of E. segetum and F. exclamationis, and this is a report on his investigations conducted during the summer of 1913 on a dessiatine (2.7 acres) of layland, being a portion

of the fallow fields of peasants of a village in the Tzarskoselsky district of the government of St. Petersburg. The plot selected for experiment extended across the middle of the fallow fields, with a boundary strip on each side. The plot was divided into six parallel sections of various sizes, out of which three, the two border sections and one in the middle, were turned into "occupied fallow"; two, on both sides of the fallow," i.e. repeatedly harrowed during the summer; while the sixth tart was allowed to grow over with weeds, i.e. kept as "peasant tallow" or "green fallow." Some of these sections were divided from each other by boundary strips of over a foot wide, others had no i-amdaries; the borders of the roads passing on each side of the plot were overgrown with abundance of weeds.

The author records chronologically all the work undertaken on the welds, giving the dates when the sowing, harrowing, etc., was done on the individual sections. Two of the occupied fallow parts were respecearly sown in the first half of June with vetches and oats, and with the s and peas; the third "occupied fallow" was sown with Ivanovsky rye." At the end of that month the "peasant fallow" was overgrown with Rhinanthus cristagalli, Polygonum convolvulus. Coronn arvense, Atriplex patula, Sonchus arvensis, Pedicularis pulustris, Laphrasia officinalis, Fumaria officinalis and other weeds.

The emergence of the perfect insects began after the 1st of July and, a order to attract them to the experimental plots, some troughs with molasses were put on the "occupied and peasant fallow." When the number of the imagines was at its maximum (from the 10th to the 23rd July), the troughs were covered with gauze to serve only as attraction for the moths, but not to catch them, as it was not desired to prevent oviposition. During the time that the moths were on the wing, the author and his assistant carefully searched the crops on the "occupied fallow" parts, but no eggs were found even on the weeds; the eggs of some of the pests were found on the vetches on these sections. mostly those of Barathra (Mamestra) brassicae, but none of E. segetum or of F. exclamationis. Examination of "occupied fallow fields" in some other parts of the district yielded the same negative result. Thus it is undoubtedly established that "occupied fallow fields" sown either with vetches, or with vetches mixed with other crops, prevent the moths from ovipositing and consequently check their multiplication. At the end of July, the vetches were mown and removed from the fields and all search for caterpillars of the pest in the soil in which these plants had grown, proved useless. Many eggs and larvae were found on the section grown over with weeds, the eggs being deposited not on the weeds, but on the straw of the not yet rotted dung: the black fallow parts also exhibited eggs, laid on the earth and on the straw of the dung; larvae were also found in the soil, although their numbers were much less than on the "peasant fallow." Besides searching the soil, larvae were also collected by means of baits with the same result. In August the whole experimental plot, with the exception of the one section sown with "Ivanovsky rye," was reploughed, manured with artificial manure and sown with rve.

Two weeks afterwards, when the seedlings appeared, the state of the various sections was as follows: -- the crops on the "occupied fallow" were quite uninjured, except near the roads and boundary strips; those on the "black fallow" (i.e. sections, which were kept in that state throughout the summer) showed considerably more injury from the larvae; while more than half the crops on the "peasant fallow" section were destroyed, and it is expected that before the arrival of cold weather, these will be totally ruined.

[Black fallow land means layland left unsown but constantly ploughed

in order to prevent the growth of grass and weeds.

GREEN (or Peasants) fallow land means layland allowed to grow over with weed grasses and used as pasture land in peasant agriculture.

OCCUPIED fallow land means layland sown with some annual plant. which either can be mown as grass (vetches with oats, turnips), or can be reploughed, the plants serving as "green manure" (vetches, buckwheat, white mustard). ED.]

ZACHER (F.). Die wichtigsten Krankheiten und Schädlinge der tropischen Kulturpflanzen und ihre Bekämpfung. [The more important diseases and pests of tropical plants and methods of control. Part I.—Deutsche Tropen-Bibliothek, Hamburg, x, 1914, 152 pages 58 figs.

This volume is intended to serve as a handbook to those interested in the cultivation of plants and trees in the tropics and is divided into two parts, the first dealing with diseases of cultivated tropical plants in general, and the second with those which attack plants of special economic importance. In the first part parasites, insects and fungi are dealt with, predisposition and immunity to disease discussed and methods of treatment, insecticides, etc., are given. The second more specialised part treats in detail of plants of special economic importance, namely, cotton, cacao, coffee and tea.

SILVESTRI (F.). Viaggio in Africa per cercare parassiti di mòsche del frutti. [Report on an expedition to Africa in search of parasites of the Fruit Fly. --Boll. Lab. Zool. Agrar. R. Scuola Sup. Agric. Portici, viii, 1914, pp. 1-164, 69 figs.

In 1912, at the request of the Board of Agriculture and Forestiv of Hawaii, the author undertook an expedition to search for parasiteof the Fruit fly, Ceratitis capitata, which had been introduced in 1910 into Honolulu and was threatening to become a serious pest. The climatic and other conditions of the Hawaiian Islands were favourable to the development and propagation of the fly and mechanical and chemical means of control had proved useless. It was therefore resolved to organise an expedition to discover its natural enemies and to introduce them into the infected areas. The author started in July 1912 for West Africa. It was resolved firstly to ascertain whether C. capitata existed in that country, south of Senegal, and, if so, whether it was attacked by special enemies which might be worth introducing into Hawaii; and secondly, in the event of C. capitata not being found. whether other species of the same genus or of the genus Dacus were available, the parasites of which might be suitable for experiment. The Canary Islands, Senegal, French Guinea, S. Nigeria, the Gold Coast, Dahomey, the Congo, Angola and South Africa were visited.

Various species of Ceratitis and Dacus were found, many of which occurred during the author's visit, in such reduced numbers as to make it seem certain that they are effectually controlled by inimical factors. The occurrence, distribution and life-histories of many of the species found are described. Certain Braconid parasites of the genera Opius, Inuchasma, Hedylus and Biosteres, and Chalcids of the genera Tetracahus, Dirhinus and Spalangia, and Proctotrupids of the genus Galesus. seem to be the most active enemies of Ceratitis in West Africa; bacterial and fungoid diseases were also observed. Some species of hymenobterous parasites attack several different species of Ceratitis and Thick; parasites of C. giffardi and C. anonae were experimentally hard by the author on C. capitata, and developed to maturity. Living adults of Opius perproximus, Dirhinus giffardii and Galesus silvestrii from West Africa, Opius humilis and Trichopria capensis from South Africa, and Diachasina tyroni from Australia, were brought to Honobild and bred there in large numbers and were then distributed to other islands of the group; but it is impossible to make any statements as regards the results of these introductions until the permanent establishment of the species has been proved. If Opius, Diachasma, Durhinus and Galesus become acclimatised, a notable destruction of Creatitis capitata may be hoped for. The details of the breeding and aberation of the different species are shown in tabular form.

The author recommended that if Diachasma tryoni does not become established on account of the small number of specimens introduced, a large number should be imported from Australia, the transportation of these parasites to Hawaii being very easy. The introduction of other Braconids of the genera Diachasma and Biosteres, parasites of Austrepha, from Mexico and Central America is advised before any towasttempts are made to introduce Braconidae from Africa, because the distance of the latter from the Hawaiian Islands and the habits of the parasites make it difficult to transport them in good condition. A comprehensive bibliography is given.

Veresichagin (B.) **Нровяная тля въ Измаильскомъ утздт.** [Schizoneura lanigera, Hausm., in the district of Izmail (Govt. of Bessarabia).] - «Садъ и Огородъ» [Orchard and Market-Garden], Moscow. Feb. 1914, pp. 74-76.

The author refers to the history of the spread of this pest and describes its habits and the damage done by it. It appeared some 6 or 7 years ago, in the district of Izmail, in the Government of Bessarabia, whence it spread to some neighbouring districts, and has greatly multiplied during the last 2 or 3 years. In some parts it is impossible to find an apple tree which is free from it, though it has not been found on any other trees. The remedies applied by the peasant horticulturists consist in digging out the attacked trees, crushing the aphids; smearing the trees with milk of lime, some of them smearing also the more infested spots with some oily substance. The author recommends that the pest should be more energetically attacked in the future, and suggests, in addition to the foregoing remedies, spraying the soil, after the attacked trees have been removed, with (K₂CS₂) or with kerosene, cutting away and destroying the diseased branches and spraying the leafless trees with kerosene emulsion.

Козтвоубку (Karl). Сливяная плодоморна, ся мизнь и пъры борьбы съ нею. [Cydia (Grapholita) funebrana, Fr., its bionomis, and methods of fighting it.] - « Турнестанское Сельское Хозяй. ство.» [Agriculture of Turkestan.] Tashkent, Feb. 1914, pp.133-13-

In Turkestan, C. funebrana is as serious a pest of plums, as Cydia (Carpocapsa) pomonella is of apple trees, but the non-recognition of the Cydia pest by fruit-growers and the considerably smaller importance is plum-growing, have resulted in a total absence of any organised campaign against it. In cases when this moth has played havoc with the viels of plums, the owners usually leave the fruit on the trees, thus creating favourable conditions for the further multiplication of the insect, The author describes the imago and egg of C. funebrana and gives some information as to its life-history. The moths appear during April and May, flying mostly in the evenings (before sunset) round plum trees and ovipositing on the surface of the plums, one egg (rarely two) being laid on each fruit. The eggs hatch 5 to 6 days after ov position, and the young larvae usually penetrate into the fruit from beneath, less frequently at the sides, and never on the top. Before gnawing through the skin, the larva makes a web over some part of the surface and in 30 to 40 minutes after emergence from the egg, p disappears into the fruit. The larvae remain inside the fruit hot more than 30 days; pupation takes place on the surface of the earth and the pupal stage lasts about 10-12 days, after which a second brook of moths appears and oviposits on the fruit as before. The first generation injures the fruit mostly during the end of May and through out June, while the second generation does so in July and August. The larvae of this generation pass the winter in their cocoons and pupate in the following spring. The author points out that the from damaged by the first generation shrivels and falls, while that damaged by the second generation does not shrivel, but ripens prematurely C. funebrana attacks also sloes, peaches, and sometimes chemis-The variety of plums known as "kok-sultan" is less injured that others. Among remedies, the author mentions the digging of the earth underneath the trees in autumn or spring and the removal of all wormy fruits. He points out that it is more laborious to fight the insect when it has already begun to be active and when all stages of it would be present, the best time for attack being autumn or spring when the pest is in its pupal stage in the earth. Thus the digniz is the more important remedy. The removal of the wormy fruitwhich is recommended in case the first remedy has not been applied. must be repeated twice or even thrice during the season. The collected fruits must be immediately buried, as otherwise the caterpillars may emerge and pupate safely. The first generation is usually less numerous and causes less injury.

Коновко (D. М.). Вредныя для сада насъкомыя и мъры борьбы съними. [Insects injurious to Orchards and methods of fighting them.]—«Садъ и Огородъ» [Orchard and Market-Garden]. Moscow, Feb. 1914, pp. 69-74.

The author's object is to acquaint fruit-growers with the necessary preventive remedies which must be applied in spring against various pests of orchards. He deals first with Anthonomus pomorum, L.

gving a popular description of the pest, its life-history and the damage ione by it. As remedies, which must be applied in spring, he suggests the cleansing of the trees from the loose bark, especially near the ground, where the weevils winter, and the destruction of the rubbish scraped off the trees, as well as of fallen leaves, etc. When the imagines appear in April, it is advisable to shake them from the trees on to deets and burn them; a detailed description of the preparation of these sheets is given. [See also this Review, Ser. A.i. p. 235.] spraving the trees with milk of lime is also suggested.

Psylli mali, Schmbg., and Aporia crataegi. L. are also dealt with against the former the author recommends spraying early in spring, in frostless days, with sulphate of iron, in order to destroy the eggs, and later, when the larvae have appeared, with tobacco extract or green soap, giving recipes for the preparation of these insecticides. A to Aporia crataegi, the destruction of the winter nests is recommended.

бакторам (А.). О возможности появленія совки на яровых ульбах поства 1914 г. въ Екатеринославсной губ. [On the possibility of an outbreak of Tapinostola (Oria) musculosa, IIb., on the summer-sown crops of 1914 in the Govt. of Ekaterinoslav.] «Южное Хозяйство» [Southern Husbandry]. Ekaterinoslav, Feb. 1914, pp. 123-129.

Tapinostola musculosa last year destroyed summer-sown, as well is winter-sown, crops in several districts of the government of Ekar-rinoslay; in May of that year, thousands of dessiatines (2.7 acres) of crops were completely lost. Many agriculturists have applied no remedies to prevent the reappearance of the pests this year, such as arming down the remains of the crops or the stubbles, and reploughing the fields immediately. It is therefore likely that a fresh outbreak still occur this year and the author suggests abandoning altogether the sowing of summer-sown crops (barley, wheat and oats) on fields damaged last year by this moth and sowing instead crops which see not attacked by it, such as peas, Turkish beans (fassol), lentils, eithers, maize, sorghum, potatoes, beetroots, bachza plants, sunflower and mustard. Rape and ravison cannot be recommended as they are attacked by many other pests.

Find (L. H.) & Storiev (G.). Methods for the Destruction of the Pink Boll Worm in Cotton Seed. Appendix.—Agric. Jl. of Egypt, Cuiro, iii (1913), no. 2, 1914, pp. 93-95, 1 fig.

The following information is embodied in an appendix to a paper astracted on pp. 218-219 of the current volume of this Review and deals with a method consisting of placing cotton seed on a metal tray, to which electrical sparks were passed from a metal brush held about sinches above it. Eight experiments were made, the results of five enigrabulated. In no case was there any abnormal mortality amongst the caterpillars and germination was unaltered or only slightly reduced, except with an almost sparkless discharge which appeared to have had a slightly beneficial effect on the seed. A spark-gap of about 4½ inches only, was used throughout, but the results did not

justify hopes that an extra 11 inch in the spark-gap would be more satisfactory. The three remaining experiments were as follows: 41. A few larvae were picked out and subjected to a shower of spart, about 4 inches in length; (2) a number of "double" seeds were treated in the same way; (3) a sheet of white paper was laid on the metal plate and the positions of 20 seeds marked on it as carefully as possible; a shower of sparks was then passed between the brush and the plate. The results of these three experiments support these of the former five. Every larva that was struck by a spark in Experiment No. 1 was killed by it, the spark piercing its skin and causing bleeding; but on the other hand, not a single larva killed by a spark could be found in the seeds from Experiment No. 2. A diagram showing the position of the seeds and of the holes pierced la sparks in Experiment No. 3 is given and demonstrates that only in one instance, that of a "double" seed, had a spark traversed any of the spaces marked out as being covered by the seeds. This shows fairly conclusively that it is quite impossible to "make sure that a spark passes through each seed," as was suggested, without an excessive waste of time and electric current.

STOREY (G.). Seasonal variation in the Common Boll Worm (Eurosinsulana, Boisd.) - Agric. Jl. of Egypt, Cairo, iii (1913), no. 2, 1914, pp. 99-102, I pl., I chart,

The variability of the adult boll worm is shown by the fact that : has been described as no less than nine distinct species, as followinsulana, Boisd.; smaragdinana, Z.; siliquana, H.-S.; frondosana Walk.; xanthophila, Walk.; simillima, Walk.; chlorion, Rub-gossypii, Frauenf.; tristigosa, Butl. Sixteen specimens which illutrate the natural variation of the species are depicted in a coloured plate, two being close approximations to the type form insulare In addition to these, three other forms which occur in Egypt have received varietal names: ab. anthophilana, Snell., ab. ochreimatgo. Warren, and ab. semifascia, Warren. These names may be used at a loose sense for the sake of convenience. Dr. Gough's observationled him to believe that the variation was very largely due to climate and seasonal conditions and at his suggestion the author arranged the very long series of moths in the Ministry's collection according to the dates on which they emerged from the pupa or were captured. The seasonal nature of the variation at once became apparent. The pure green type is the normal summer form; while during the winter the predominant form is ab. anthophilana, which is of a uniferta yellowish tint sometimes orange-except for some narrow dark lines across the wing.

GOUGH (L. H.). Entomological Notes.—Agric. Jl. of Egypt. Caire. 49 (1913), no. 2, 1914, pp. 103-106, 1 pl.

A parasite of the Pink Boll Worm, Pimpla roborator, Fabr. is fairly common near Cairo, and, accepting the theory that Gelechii gossypiella. Saund. is a recent introduction into Egypt, it must be supposed that this Pimpla has recently taken to preying on Gelechii larvae. The larvae are known to feed externally on a great variety

of other insect larvae. They superficially resemble fly-maggots and are found in seeds hollowed out by the Pink Boll Worms. The adult usects are very common just after the cotton picking in the sheds where unginned cotton is stored, and may be found flying over the cotton and crawling amongst the lint. Nearly all through the year they may be taken flying over the large thistles common on the margins of the desert near Me'adi, and do not appear very particular in their choice of a victim, provided it is a boring insect. It is possible that more than one host larva is destroyed and although not yet definitely observed feeding on Earias larvae (Common Boll Worms) they probably do so.

i New Cotton Insect. Cryptoblabes gnidiella. Mill., a small Pyralid moth, has been bred from cotton bolls collected at Belqus and Desuq a November 1912 and at Damanhur in December 1913. This very griefly distributed species also occurs in Europe, and seems to be a general feeder. It has also been reared from pomegranates from Gizu m July 1912. As yet it has caused no appreciable damage to the cotton crop.

The Khirga Oasis Date Worm. The quality of the dates yielded by the 400,000 palms in the Kharga Oasis is infinitely inferior to the finit exported from the neighbouring Oasis of Dakhla. This is due to a great extent to the ravages of the larva of a Pyralid moth, Ephestia wield. Walk., which feeds on the dates when half-ripe. The mabitants of the Oasis are said to pick their dates half-ripe and roast them in order to kill the larvae. The larvae leave the dates to pupate, spaning a very loose cocoon, consisting only of a few threads. The arthor found them in 1912 pupating in the date store of the Western Oasis Company, behind loose plaster and in cracks of the wall. This species is often parasitised by Rhogas kitcheneri, Dudgeon and Gough, and also occurs in the Delta, where, however, it does not appear to the much damage. It has been found feeding on pomegranates and lass been bred from pears imported from Beyrût.

The Pomegranate Butterfly. Although the pomegranate butterfly, irrachola (Deudorix) livia, Klug, is well known t cultivators of megranates from the damage its larvae does to their fruit, the ature insect does not appear to be often observed by them, the eggs are laid on the fruit soon after they have set; the soung larvae penetrate into the pomegranates and feed there. A mosty mould often follows these ravages. The larvae leave the first to pupate. The butterflies are on the wing in April-May, lalv-August, and in December-January. In Egypt the caterpillars and no pode of Acacia edgworthi. The best method of preventing is by bagging the fruit as soon as it sets, i.e. in March April Transparent paper, coarse muslin, or palm-leaf bags do not the purpose. In addition, all damaged fruit should be refected and buried at least two feet deep.

Description of two Braconids parasitie on Earias.—Agric. Jl. of Egypt, Cairo, iii, (1913), no. 2, 1914, pp. 108-110, 2 pls.

The two new species described are Rhogas kitcheneri and R. lefroyi.

R kitcheneri s parasitic on the Egyptian boll worm as well as on

the date worm and is widely distributed in Egypt. There is no doubt that it might be as effective in the control of Egyptian insects at R. lefroyi has proved to be in India, and, of course, requires no acclimatisation. This insect deposits its eggs in the larvae of the host whence its larvae emerge, pupating outside in small, ovoid, silken cocoons, generally found associated with the dead larva of the host Rhogas lefroyi has been frequently mentioned in reports on Earies, both in India and Egypt, but has never been described. Specimens introduced into Egypt were not successfully established and the discovery of R. kitcheneri now renders its acclimatisation unnecessary.

MELANDER (A. L.). Winter Sprays: Sulphur-lime Wash and Crude Oil Emulsions.—Washington Agric. Expt. Sta., Pullman, Popular Bull. no. 64, Feb. 1914, 8 pp.

What is known as the 1: \frac{1}{2}: \frac{1}{2} formula for sulphur-lime contains Sulphur (flowers, or ground sulphur) 1 lb., good stone lime & lb., water allon. This may easily be remembered and adapted to any size of cooking vessel. This should read about 28° Beaumé, corresponding with 1.2357 specific gravity. Experiments have shown that a solution containing 1 lb. sulphur and 1 lb. lime to 5 gals. of water is sufficiently strong for spraying dormant orchards. Such a solution has a specific gravity of 1.02. Sulphur-lime of any strength may be reduced to the 1: 1: 1 formula by the following calculation:—the decimal of the specific gravity of the concentrate, divided by the decimal of the dilute, gives the number of volumes of diluted spray obtainable from one volume of the concentrate. For instance, 2357, the decimal corresponding to 1: \frac{1}{2}: \frac{1}{2} sulphur-lime, divided by '02, the decimal of $1: \frac{1}{2}: 5$, gives approximately eleven. One volume of the $1: \frac{1}{2}: \frac{1}{2}$ strength will therefore dilute to eleven volumes of ready-to-use solution If a factory-made sulphur-lime, testing, say, 34° Beaumé, or 1:301. specific gravity, is used, its decimal 3015, divided by 02 would indicate instrument to the fruit-grower. The temperature of the liquid to be tested should be about 65° F. Crude oil emulsions are coming into favour, one point being the greater ease with which an oil spray spreadand penetrates, thus insuring a more thorough application than with the watery solution of sulphur-lime. The author gives the following formula: Soda 3 lb., hot water 10 gals., fish-oil soap 20 lb. (these form the emulsifier), crude oil 20 gals., and water to make up 200 gais The soda should be dissolved first in the hot water followed by the fish-oil soap. This emulsifier is then added to the spray tank contains ing 167 gals, of water, and the agitator is run at full speed. The of is then slowly poured in while the agitator churns the mixture into a coffee-and-milk-coloured liquid which contains 10 per cent. of crudoil. After the emulsion is made, nothing else, not even water, should be added, or the oil might separate. This California formula is basel on a 200-gallon tank equipped with screw-propeller agitator and gasoline engine pump. In applying winter sprays it is important to cover every side of every branch. While most pests occur on the surface some few individuals hide behind the buds, in the cracks of the bark or at the tips of the branches. These neglected individuals are the ones that tide the species over the winter and make spravice again necessary in the following year.

TRABUT (--). A Propos des Plantations de Vignes françaises dans le Departement d'Alger Phylloxéré. (On the Plantations of French Vines in the Department of Algiers infested with Phylloxera.)— Bull. Agric. Algér. Tun. Maroc., Algiers, xx, no. 3, Feb. 1914, p. 92.

M. Bertrand states that there is great danger in urging the vine-growers to plant French vines at this time, in the hope of being able to protect them from the attacks of *Phylloxera* by means of insecticides. None of the treatments of winter-eggs will prevent the young vine plants, which have been so imprudently planted, from being attacked by this pest.

RUTHERFORD (A.). Xyleborus compuctus, Eichh., a Borer of Tea and Coffee.—Trop. Agric., Peradenyia, xlii, no. 2, Feb. 1914, pp. 131-132.

In October 1913, the Entomologist received from Wattegama, specimens of tea plants from the nursery said to be attacked by shot-body horer. Of these plants 50 per cent, were damaged, the point of attack being below the ground-level. The insect, though resembling Nyleborus fornicatus, Eichh., was at once seen to be a different species, and the beetles in each tunnel are much more numerous than in the case of X. fornicatus. It appears to be identical with specimens of a Solytid received in September 1911 from Pelmadulla, where they had been attacking Coffea robusta, which Green regarded as almost certainly X. coffeae, remarking that this pest had not previously been recorded from Ceylon. It has been identified by Col. Winn Sampson as X. compactus, Eichh.

Nogais (F. de la Mare). Locust Work in December. Agric. Bull. Fed. Maloy States, Kuala Lumpur, ii, no. 7, Feb. 1914, p. 186.

The eatch of locusts in Selangor for December was 1,500 tins, representing 400 swarms; experiments have been carried out giving very lavourable results, and it is hoped in dealing with the next generation to supplant the bag-trap system to some extent by the use of poisons. Flying swarms in various parts of the State have been kept under observation.

FERNOS (F. G.). Notes on Indigo Planting in Malaya.—Agric. Bull. Fed. Malay States, Kuala Lumpur, ii, no. 7, Feb. 1914, pp. 187.188.

Attempts which have been made recently to cultivate indigo as a absidiary crop amongst young coconuts and rubber at Kuala Lumpur, have shown that it is unlikely that this plant will do well, owing to the appearance of an insect pest. This is the larva of a moth (not as yet dentified) which eats the leaves and young shoots. It is probable that if the cultivated area extends the pest will become more prevalent. In consequence, it is not deemed advisable for the present to extend the cultivation of indigo in Malaya.

PROGGATT (W. W.). A descriptive Catalogue of the Scale Insects: (Coccidae) of Australia.—Agric. Gaz. N.S.W., Sydney, xxv, pt. 2. Feb. 1914, pp. 127-136, 1 pl.

The first part of a catalogue of Australian Coccidae is given, in which the species are described, with their mode of occurrence and distribution. In the present part, 14 species of the genus Aspidiots are dealt with, of which three are new, namely A. alatus, occurring on the twigs and leaves of Eucalyptus at Dubbo and Wagga, N.S.W. A. confusus, on the trunk and branches of a white gum (Eucalyptus sp.) at Narara; and A. coralinus, on the young foliage and branchlets of a scrub tree (Eremophila startii) near Bourke, N.S.W.

Cacao Beetles and Thrips.—Bull. Trinidad and Tobago. Dept. Agre. Port-of-Spain, xiii, no. 78, Feb. 1914, pp. 43-44.

F. W. Urich is reported to have stated (January 1914) that he had not met with any particularly severe attacks, but on many estate, beetles (Stirastona depressum) and larvae were being caught in largenumbers and the moment was opportune for spraying trees, especially those from three to five years old. The beetles are very active during the dry months and spraying should be done immediately. Underecommends that posters be printed calling attention to the beetles and the methods of control, which should be put in conspicuous places in the badly affected districts. Thrips (Heliothrips subrocinctus) were on the increase. To prevent damage to the June crop, spraying required before the new growth of leaves begins. At Sangre Grandsone fields affected by thrips in 1911 and 1912 which were forked and limed in the latter part of 1912 were not seriously infested up to the present.

McKillop (A. T.). On the conversion of cotton sticks into charcoal for the destruction of the Pink Boll Worm,—Agric. Jl. of Εφης Cairo, iii, (1913), no. 2, 1914, pp. 127-129.

The pink boll worms, Gelechia gossypiella, are now present literally in millions, in the dry cotton bolls stored on the tops of the fellahin houses. According to A. Andrés, the larvae form cocoons in the interior of the seeds and remain in a dormant state for as long aseven months, without requiring any nutriment. The storing of cotton sticks containing dried and diseased bolls, which afford pretection to the moth and larva, allows the generation to be carried on from one season to another. It might be advisable to introduce into the ordinance now under reconstruction, a proviso that all cottes sticks be destroyed by fire or carbonized before a fixed date. It s obviously of importance to retain as much fuel as possible and the carbonization of the wood suggests a compromise of economic value The inconvenience that cultivators will be put to is not a suffice to reason for refusing to carry out what will not only be a means destroying and preventing the reproduction of the pink boll wornbut also of reducing the numbers of the common boll worm (Earl)? insulanu). It is recommended that all cotton sticks be converted into charcoal before removal from the fields. A table is given of il results obtained by the baladi method in 7 districts. The return

of charcoal varied from 9 per cent, in one instance to 55 per cent. another. The average return of charcoal was just under 34 per cent. It is thought that in the highest percentages (one of 55 and three of 48) the charcoal must have been damp when weighed and a large amount of dust included. The baladi method is as follows: The cotton sticks are closely packed into a pit about 20 inches deep by 16' 8' long and 6' 8" wide at one end and 3' 4" at the other, and heaped up to a height of about 4' 2" above ground-level; a layer of straw refuse, several inches deep, is spread over the surface, leaving a portion of the narrow end uncovered, which, for choice, should be the end from which the prevailing wind blows. Three or four ventilation holes are opened at the sides and the wide end, to regulate the draught. The sticks at the exposed end are there lighted, and when the fire has got a good hold the end is closed with straw refuse or some other damping material. During the process of burning, which may last from 24 hours to 3 days, water must be frequently applied to prevent the kiln from bursting into flame. Messrs. Kingsford and Crewe have patented a retort which will convert small lots of cotton sticks into charcoal in a few hours, and is capable of making from one-quarter to half a ton per day. It can be seen working at Gezira. The calorific value of the charcoal is 7:420 as compared with that of cotton wood, 2.744. Ordinary charcoal is retailed in Caro at £(E)8 to £(E)12 per ton. The cotton stick charcoal was readily bought at £(È)4 per ton and this price more than covers the Mense of burning. In enacting complete legislation against the tank boll worm, it will be necessary to provide for its destruction in the field, as well as in the seed, at the time of ginning.

GROHMANN (-). Die Generation des grossen braunen Rüsselkäfers (Hylobius abietis) und seine Bekämpfung. [The large brown weevil (Hybolius abietis), its reproduction and control.] -Tharandter Farstliches Jahrbuch, Berlin, lxiv, no. 4, 1913, pp. 325-361, 3 figs.

The available knowledge concerning the reproduction of the pine seevil (Hylobius abietis) and control measures against it, is very usufficient. Since 1909, the author has made a study of its life-history, which has been facilitated by a system of trapping devised by him primarily for the destruction of the pest. The trap is made by digging a hole measuring about 2 feet each way. If the soil removed is not saidy or loose, it must be reduced to a uniform fineness, free from large touts or stones. Eight to twelve posts of fir, with one end sharpened to a point, are driven into the hole at regular distances until their tops are only about 8 inches above the edge. They should be about 3 to 4 siches thick at the top and their length excluding the sharpened tom: about 32 inches. The fine soil is then put back till the hole a filled level with the ground. Fir branches about 3 to 5 feet long are then laid flat on the ground between the posts with their tips outwards and their stems inwards. Ordinary soil, freed from very large roots and stones, is then strewn over a surface extending from the centre to about a foot beyond the posts and packed in round the branches and the posts. A stratum of soil about 2 inches deep is then pread over the branches and on this another layer of branches is laid as before. This process is repeated until the posts are buried some

6 inches deep. In this manner a small mound is erected with edges fringed with green twigs. Instead of fir, pine may be used for the posts and branches, but the former is much to be preferred. The author states that these traps attract the beetles, which remain there during mating and oviposition, so that specially threatened plantations may thus be saved. They also afford a refuge and breeding place for many reptiles and insects which prey upon Hylobius in all its

stages.

On being fecundated, the female goes into the heap in order to lay her eggs under the bark, in the cambium of the branches and posts, preferring places where the bark has been damaged and pieces of it have been removed. The eggs are laid singly in May, and oviposition continues through the summer and even until the end of September. Most of the eggs are laid in June, July and August. The author states that after reproduction, all the adults emerge from the traps and dirin the open. This view is based on the fact that living individuals were only found in the traps from May to October and principally from June to August, whilst none have been found hibernating in numbers anywhere in the German forests. The author believes that the few which have been found are late autumn broods which have not had an opportunity of breeding.

On beginning to feed, the larvae first make galleries under the bark in the cambium and also in the young woody fibres and later penetration to the sap-wood. Their growth is complete after the third month and their size then varies from \(^4\) to 1 inch. In the traps the larvae developed in the thick portions of the branches as well as in the posts. The pupal stage lasts about a fortnight, and the whole normal development occupies about 15 months. This time may be varied by circumstances to anything between 13 and 22 months. The author states that the beetles which appeared in clearings or young plantations in April, May and June, 1913, were hatched from eggs laid from July to September, 1911. The beetles appearing in July, Angust and September, 1913, hatched from eggs laid from May to July, 1912. Beetles completing a long reproductive cycle appear in the spring, and beetles

starting a long reproductive cycle appear in the summer.

Besides Hylobius abietis the traps were also used by H. pinastr. Pissodes notatus, Hylesinus piniperda and H. cunicularis. Other inmates were: slow-worms (Anguis fragilis, L.), various lizards. Hemiptera, spiders, ants, centipedes, millipedes, Staphylinds. Elaterids, ground-beetles, and Braconids. The larvae of the Elaterids and of the ground-beetles seemed the most active destroyers of Hylobius larvae. Of the ground-beetles those most frequently met with in the traps were: Pterostichus oblongopunctatus, Abax stiola. Carabus auratus. C. cancellatus. C. granulatus, and C. violaceus. The Braconid eggs were laid in the Hylobius larvae; the author also found numerous white, very thin wire worms \(\frac{1}{2}\) inch long, which he believe feed on Hylobius larvae. It is further certain that the beetle has many other enemies besides those mentioned here.

This beetle is able to seent freshly cut timber at considerable distances, and clearings become centres for further infestation. So far all control methods have failed and at present the pest is allowed to levy a heavy toll quite unchecked. A record is given of the various measures hitherto tried. The author is positive that the traps described

here, provide a sure means of combating Hylobius abietis. They have been subjected to tests extending over a number of years and have given excellent results, both in the mountains and in the lowlands. In the numerous trap inspections personally carried out by the author, large numbers of natural enemies were found. An important point is that depressions in the ground must never be used as sites for traps. Wherever possible the latter should be placed on high ground. They should be constructed as directed, but exaggerated accuracy is not necessary. According to the distance from which the branches were brought, the cost of each trap ranged from about 9d. to 15d., the value of the wood not being included. The cost per acre varies according to the control desired, as set forth below. Traps should at once be constructed where (1) it is desired to protect the edges of a plantation; (2) the areas infested by the beetle are required for planting, (3) beetles are unusually numerous on any particular spot. Edge protection is nearly always necessary on the sides of a clearing, especially where it borders on young plantations, and it should also be carried out where young plantations border on old ones in which much umber has been felled. In cases where the timber has been cut down in summer, the traps must be constructed immediately. Where clearing has been done in winter, they should be prepared about the middle of April. In any case they must be ready by the time the heetle begins to feed. At first the traps may be placed at intervals of about 60 yards. As it is important that freshly baited traps be constantly present, new ones may be constructed along the same line later on at distances of 20 yards. For instance, a line of traps 60 yards distant one from another is constructed by the middle of April, and added to at the beginning of June and again about the middle of July. Thus, if the line has 10 traps at the start there will be 30 at the end of the campaign. Early in spring the traps must be dug up and the soil spread evenly around the hole. The posts and branches, with the wetle brood contained in them, are burned. There need be no fear that any natural enemies will be sacrificed, as but very few will still be present. If this system of protection is required to be renewed a second or third year, the old holes may be used to save expense. Where clearings left untouched during one summer are to be replanted, they should be studded with traps if beetles are present. Only a few traps are required for this purpose, one being sufficient for every 2,500 square yards approximately. These traps should be established immediately the replanting is effected and will chiefly serve to catch fresh arrivals. To deal with the beetles native to the spot, well-baited traps must always be present. To ensure this, two new traps should be constructed near the old ones at fortnightly intervals starting from about the middle of July. Thus a clearing which has lain untouched for a rear will contain four traps to every 21 acres in spring and this number will increase to 12 traps by the end of the year. In the following pring the traps must be cleaned out and the posts and branches burned. Four of the traps must then be re-constructed, and they will serve to catch the beetles resulting from eggs laid late in summer two years before. It is well to duplicate each of these four traps in July or August to catch beetles appearing in those months from eggs laid when the replanting was in progress. This second year's batch of right traps must be cleared as usual in the following spring and control

may be considered as accomplished. Should further injury be noticed it is due to beetles from neighbouring timber, and therefore it is advisable to continue the edge-protection mentioned above for 80ms time longer. Where beetles are to be combated on clearings which have been untouched for two years, the same method is used as for protecting "lantation in the second year of its growth. For instance after such plantation has had edge-protection during the spring and summer of 1912 and 1913, it must be provided with four traps per 24 acres to start with and one or two extra traps must then be added in July or August. In this case, control may be considered complete when the traps are cleaned in the following spring. A great advantage of delaying replanting until two summers have passed is that such replanting escapes the period when the beetles are most abundant Where replanting is carried out after one summer only, great care .. necessary for the properly-timed construction of the supplementary traps, or damage will be done to the young trees.

Where the aim is to destroy Hylobius abietis without any thought of protecting plantations, the best time for setting the traps is when the pest is most abundant. If clearing is effected in winter, then the following months of July and August are best suited. If effected, say in August 1914, then the favourable time would be in April 195. The time at which this system of trapping should begin is strictly regulated by the data given above as to the life-cycle of the week. The system is simpler than it appears at first sight and the authorpublishes it with the conviction that many a pine and fir plantation will be saved by means of it.

NEGRI (U.). Il Rinchite del Mandorlo. [The almond Rhepachtes] — Boll. Catt. Amb. & Agric. Brindisi, viii, no. 2, Feb. 1944, pp. 12-13.

The author has observed the first two generations of the Rhygheta which infests the almond, a tree of great economic importance in Puglia (where the post is called campa or campio) and in Sicily. About the end of February or the beginning of March, the females pierce the buds and deposit in each, one egg from which a yellow-red larva emerges. This feeds in the bud, working in a circle and covering the pistils with a silky froth which prevents the bud from opening. The larva completes its cycle within the flower during the period of pollination, which varies from 15 to 20 days. It appears as a perfect insect just about the time that the fruit acquires its shell and pierces the tiny fruit with its proboscis in order to deposit the eggs for the second generation. This injury causes the fruit to fall and where infestation is severe the crop is lost from that moment. The author has observed that when two larvae meet the stronger devours the weaker.

Fuchs (-). Ueberblick über die forstliche Entomologie. [A bref survey of Forest Entomology.]—Entom. Zeitschr., Frankfurt a. M., xxvii: nos. 24-26, 28-30, 32-36, 39-42, 44-45; 13th Sept. 1913-7th Feb. 1914.

The author deals with all the forest insects of Germany, giving a full account of those of economic importance and a cursory notice of others. The subject matter is arranged on a systematic basis, in order

to avoid the repetition entailed by the handling of the subject according to timbers. The text contains numerous figures illustrating the insects and the injuries they cause.

P. F. Die Organisation der Wurmbekämpfung mit Nikotin. [The organisation of vine moth control with nicotin.]—Luxemburger Weinzig, Grevenmacher, ii, no. 3, 1st Feb. 1914, pp. 37-40.

Control of vine pests, particularly that of the vine moth, demands the united action of all vine-growers in order that the cost of material may be reduced and success ensured by speedy application. The flight of the moths only lasts from 8 to 10 days and it is necessary to use all available means in that period. A system of co-operation would be a great help. If spraying with nicotin were carried out in every vine-ard, one application would probably suffice per year, but where control and universal, two applications are required.

ZSCHONKE (A.). Massnahmen zur Hebung des Weinbaus. [Measures for the improvement of viticulture.]—Weinbau der Rheinpfalz, Neustadt a. Hdt., ii, no. 3, 1st Feb. 1914, pp. 26-32.

The area devoted to viticulture in Germany is shrinking, and furthermore the site value of vineyards is now only $\frac{2}{3}$ or $\frac{1}{3}$ that of about 20 years ago. One of the three reasons given by the author is the more difficult and more costly working of vineyards. It is necessary to plant vineyards in such a fashion that pest control may be rendered easy and attainable with the smallest possible outlay of time and labour. One necessary reform is the abolition of cross-haulks. Wherever possible, wood must be replaced by stone, iron, and iron wire. Planting in rows will permit the plough to be used for turning up the soil. The fastening of the summer-shoots with straw is obviated by passing them between two wires. Spraying associations will cheapen, smphly and speed up the application of insecticides. Co-operative beying will effect saving in purchasing material. Lastly, the small gower will save by abstaining from experimenting with all kinds of so fet preparations.

Nationegolev (I. M.). Вредныя насъкомыя и бользни растеній, наблюдавшіяся въ Таврической губерній въ теченіе 1913 года. [The injurious insects and diseases of plants noticed in the Govt. of Taurida during 1913.] « Отчеть о дьятельности помощника Губернекаго Энтомолога Таврическаго Земства за 1913 годъ.» [Report of the Assistant-Entomologist of the Zemstro of the Govt. of Taurida for 1913.] Simferopol, 1914, 24 pp.

The author begins his report with the remark that the last year can be called a "year of Lymantria dispar," as this was the principal pest, appearing over an area of some 54,000 acres and threatening to play latter with forests and orchards. It was evident in the preceding arumn that an outbreak might occur, indicated by the large amount diegs deposited; an examination of the forests confirmed these fears. The author mentions the precautions taken by the Station in order of acquaint the population with the threatened danger and with the remedies which ought to be immediately applied. Certain orchards,

though situated in the most threatening surroundings, near forests and mountains from which the caterpillars were constantly brough by the wind, had full leafage, as their owners conducted the fight against the pests energetically; while, where no remedies were applied the trees were quite leafless and gave no harvest. At first when it, caterpillars were small and were being transported by wind, constant care was necessary, the measures adopted being, spraying with Pangreen or with the latter mixed with Bordeaux liquid, and shaking ticaterpillars from the trees. Owing to the small doses of poison applied there was some delay before the caterpillars were destroyed: Mollice owners tried tobacco dust, but without beneficial results and had to return to the above-named insecticides. The author thinks it a matter of regret that nowhere has Djipsin been tried, as this is a stronger poison than Paris green and causes no injury to the leaves. When the movement of the caterpillar ceases, the principal remedy consisted in bait-belts, which proved very valuable, although most owners had no sticky material of a good quality. [See this Review, Ser. A. ii, p. 271

The author proceeds to deal with the following pests:—Psylla pga, L., has not done much damage, although an outbreak was expected in view of the great amount of eggs. It is assumed that the cold which prevailing during the hatching time of the larvae had a prejudical effect.

Hoplocampa brevis, Klug, has injured a great number of ovaries of pear trees in some localities in Alushta; beyond shaking down from the trees, no remedies were applied, although spraying of the unfolded buds with milk of lime or carbol-emulsion might have prevented more harm.

Anthonomus pomorum, L., multiplied in great numbers and ladone serious damage to ovaries of apple and pear trees in many part of the country. Very often the owners mistake the damage done is this pest for that caused by frosts and take no measures against is shaking down from the trees and belts early in spring are suggested. The damage actually done was to some extent diminished owing to the early blossoming of the trees and to the late appearance of the weevils, which occurred in many places after the fruit was set. Rylin chites partillus. Germ., appeared as usual, and R. bacchus, L., dit noticeable damage to apple trees in some localities.

Cydia (Carpocapsa) pomonella, L., appeared in great numbers some orchards, as many as 150 caterpillars were found underness one belt. A large number of caterpillars hibernated, special attention

should therefore be paid to the bark of the trees.

Aphis on apple and pear trees appeared nearly everywhere. To fight against these lice in the Crimea is made more difficult owing their appearance at the time when the trees are first sprayed with Bordeaux liquid and Paris green, which fungicides do not affect pests and at the same time make it troublesome to repeat the sprayed with other insecticides; when this is done later, the lice have already curled the leaves and thus formed some sort of protection for themselves against the poison.

Eriocampa adumbrata, Klug, caused great devastation in the lower parts of the river Katcha; the larvae attacked mostly cherry tree but also apple, pear and nut trees; it was impossible to apply remedies as the time of the outbreak coincided with the cherry harvest.

author remarks that such an outbreak has not occurred for many

Laperus rufipes, Scop., was observed in noticeable numbers on some apple trees, as well as on alder trees, in the valley of the river Alma, colerna crataegi, Bach. (xanthomelaena, Schr.) appeared in some parts cound Simferopol on elms. Some species of Lecanium probably Lorni, Bouché, were found in large numbers on apple trees in one scality, where they have never previously appeared. It is assumed that the pest migrated from the forests to the gardens. Lyonetia clerkella supeared in extraordinarily large numbers, being absent only in a few insit gardens and on scattered apple trees. This outbreak has not resulted in serious damage, only the trees attacked early in the season taking suffered seriously.

thoreutis parialis, T., also appeared in enormous numbers in the hards along the river Katcha. The following remedies are suggested: spraying with Paris green or with Bordeaux mixture and Paris green, and applying belts so as to prevent the caterpillars which take been thrown from the trees by the spraying from getting back; the spraying must be done at the end of June, before the caterpillars ave get underneath the ends of the leaves. Hyponomeuta malinellus, A. did not do serious damage, although appearing in large numbers. It was noticed that the increase in the caterpillars was quite suddenly mosted. This is explained by the great multiplication of their mastes, which succeeded in stopping their spread.

The first generation of *Phlychenodes sticticalis* seriously damaged market-gardens, orchards and grasses, and the moths of the second generation hatched out in enormous quantities, but perished without apositing. The aphis, *Brachycolus noxius*, Mordw., did noticeable lamage to winter-sown crops in the district of Eupatoria, although their numbers were much less than last year.

Борьба съ вредными насъкомыми въ лъсничествахъ Тамбовской губерніи въ 1913 году. |The fight against injurious insects in the Forests of the Government of Tambov in 1913. |- «Лъсная Жизнь и Хозяйство.» [Forest Life and Economy.] Tambov. no. 6, March 1914, pp. 15-18.

Equious insects in the forests of the government required less station in 1913, owing chiefly to the fact that it was not a cockchafer that. In the three forest areas in which organised collections of Modontha meloloutha took place, only 1,314 lb. were obtained as compared with over 26½ tons in the previous year. In the forests Vindreev and Fastchevsk, tobacco dust was either scattered over the ground or dug into the soil. The efficacy of this method is still in with as there has not yet been time to test it properly.

In the pine plantations of the forest of Gorielsk, an undetermined that which attacks the young shoots did considerable damage in 1912; in 1913 the collection of these insects were undertaken. Their Phennee in the trees could be ascertained by thick swellings on the attacked shoots, marking the place of entry and smeared with a belieus exudation, most of the attacked pines being covered with and in order to extract the pest from the shoots, the latter were safefully tapped with sticks. During May and June some 197,000

insects were collected in this way on an area of 305 acres; the ships, from which the insects were extracted recovered and it is suggested that this method should be applied again in 1914. Euprofy, chrysorrhoea appeared in the forest of Borisoglebsk, where its way were collected from oak trees over an area of 453 acres.

In the district of Pri-Usman, in forests consisting chiefly of let and oak, with a mixture of aspen, operations against Relinia acquindertaken, consisting of cutting off and burying the branches which the larvae had begun their attacks; and it is thought that 1914 the damage by these insects will be less.

Lophyrus pini appeared in the forest of Bokin and Hylobius almost in that of Pushtin. In the forests of Romanov and of Jarov, Lopis derium pinustri was noticed in nurseries and the seedlings were two sprayed with Bordeaux mixture, after which they recovered in area. About 15 per cent. of the seedlings perished from this pest.

UVAROV (В.). Задачи и программы дъятельности энтомологических учрежденій. [The objects and programmes of the local enter, logical institutions.] — «Земледъльческая Газета.» [The described for a collustic distribution of the collustic logical institution of the collusti

The question as to the best types of local entomological institution. was raised at the First Russian Conference on Applied Entomological in Kiev in August of last year, and although the time at the dispenof the Conference did not allow of a thorough discussion of the problethe idea which met with general approval was that it is necessary: distinguish clearly between the objects of Entomological Station or Branches of Agricultural Experimental Stations and of Enter logical Bureaus. The author points out that Entomological States must be chiefly concerned with the study of insect pests under nat. as well as experimental, conditions: this can be best arrived at withe Entomological Stations are connected with, and form a branch the General Agricultural Experimental Stations. Entomological Bureaus should be confined to acquainting the party with the results of scientific studies and giving practical assistance. them in fighting various injurious insects. Their objects should inthe popularisation of entomological knowledge by means of posters pamphlets, lectures and of object lessons and experiments: " publication of local popular literature of a periodical character the giving of advice as to the necessary current work in field at garden at each season.

The author further urges that the Bureaus should undertake organisation of measures against pests, for which purpose structured funds ought to be placed at their disposal: he does not go into the question of how these funds are to be raised, as the answer to this vary in different localities. These Bureaus should, he thinks be for more numerous than the first-named type of Stations, and their a fawill be of considerable help to the latter in accumulating experience and practical data.

Моккисскі (S. A.). Вредныя насъкомыя и бользни растеній, наблюдавшіяся въ Таврической губерній въ теченіе 1913 года. [The injurious insects and diseases of plants noticed in the Govt. of Taurida during 1913.]— « Отчеть о дъятельности Губернскаго Зномолога Таврическаго Земства за 1913 годъ. [Report of the Chief Entomologist to the Zemsteo of the Govt. of Taurida for 1913], Simferopol, xxi, 1914, 13 pp.

The author deals only with certain points of importance regarding a insect pests noticed during the year under report, more detailed rmation being contained in the report of his assistant. He deals with Brachycolus norius, Mordw., which did enormous damage 1912, decreasing the harvest in the area infested by 75 per cent. the author suggested ploughing the soil carefully for winter-sown tops and sowing them as late in the season as possible; in all places these remedies were acted upon, the state of the crops in the crops of 1913 was very good. However in April 1913, the aphids peared on trap crops of winter-sown wheat, which, in the form of a wide strip, surrounded a field of 918 acres: these trap strips were - an early, at the end of the preceding summer, as a protection against Magricola (Creidomyia) destructor and owing to their specific purpose ald not have been reploughed; the sowing on the field inside this "p was carried out later. The author found that colonies of lice asted only on the trap strips, while the crops on the field were free was them; he recommended mowing the trap crops and re-ploughing we find, and after this had been done no more lice were noticed. some time later colonies of lice appeared also on some other plots of a and area of 378 acres, which had to be reploughed, the District Lastvo compensating the owners at a rate of 7s. 6d. per acre.

Examination of the plants at this season resulted in the discovery. the central shoot of the grain, of colonies of lice consisting of one dut and up to a dozen young larvae; the first nymph was noticed the 1st May. Some syrphid larvae were also found in each colony stacking the lice. This led the author to consider that winter-sown so it would not be injured by the pest, but that barley and oats at he damaged; the result confirmed this view and only after second half of the summer did the number of lice increase and re sporadic damage occur. Special investigations on Brachycolus * is conducted during this summer by N. A. Grossheim, particularly respect of their parasites, oviposition of winter eggs, etc., and a word on these investigations will be issued. The author points out " Frachycolas noxius lavs its winter eggs on the germinating shoots fallen grain and recommends the careful removal of all such grain. dementions that the District Zemstvo of Eupatoria has decided to attent a district entomologist, principally to study and deal with this Crops of winter-sown wheat in the same district were also or aged by some small velvet black mites with yellow legs, the and the state of which has not yet been established; these mites suck the are leaves of the seedlings causing them to wither; they are to be and in groups on the axils of the leaves and are very easily disturbed.

The next pest dealt with is Lymantria dispar. The author refers in his observations regarding this pest in his last year's report [see 1.4.8 Review, Ser. A, i, p. 361-364] and to the remedies there suggested.

The hatching of the caterpillars this year commenced on the southern slopes of the mountains in the middle of March, while on the northern slopes it took place after the end of the month and continued during nearly the whole of April. The number of the caterpillars was enormous and parasites (Hadronotus howardii, Mokr.) were then ver seldom found; only in case of egg-masses smeared with naphtha. kerosene did the eggs fail to hatch. The young caterpillars are transported by the wind and got into orchards, where they did or siderable damage, especially to apple trees; but after the middle May the numbers began to decrease, owing to parasites, such a Apanteles fulcipes, Hal., and A. solitarius, Rtz., and in June 15orchards and woods were practically free. Apart from the effect, of the parasites and of a fungus disease similar to flacherie, it was observed that many of the insects were dwarfed, while there was a considerable prevalence of males over females and a decrease in tilnumber of eggs laid. The size of the dwarfed moths was only have the normal; the percentage of males was in some cases 88 per cerand while the normal females have up to 1,200 eggs in their ovaries the dwarfed ones had only 60. The females hatched out were so wear that they perished without unfolding their wings and before they la . any eggs. Caterpillars collected in June in the forests of the Crimes were also infested by Tachinids and of 2,000 adult larvae collected one wood, only 32 per cent, produced imagines, while the remainder were killed by parasites. The author thinks that the year 1914 a. not witness the appearance of the pests in any noticeable degreexcept in those spots to which the caterpillars have been carried by the wind and have found specially favourable conditions. I. M. Shtchegolev undertook the statistical part of the investigations, while author, in company with Miss A. P. Bragina, studied the biology parasites of the pests and the effect of various insecticides. These studies will be continued this year. He mentions some facts observed which are in conformity with the conclusions of American investigators pure pear plantations were little damaged, while when mixed with apple trees the former suffered more, and the latter less. Pure beech woods are practically left untouched by the pests, but when scatter: amongst oak trees they diminish the injuries to oak, while suffered: themselves. The same is also the case with regard to pines, who are totally devoured when situated amongst deciduous trees. Corbo are only touched by the first generation of caterpillars, as observe by Shtcherbakov.

Observations conducted at the Experimental Station of Salgrishave shown that there are various species of Psylla in the Crimea, the following having been identified by Dr. Karol Sulc., of Moravia Psylla pyrisinga, Först., P. melanoneura, Först., P. albipss, First., P. prathoris, Sulc., P. horeathi, Sulc. The first two species have occurred in large numbers on pear trees, P. pyrisinga having orgeneration, and P. melanoneura two. Up till now it has not been definitely established which species live on apple trees and which expear, and this has led to mistakes and to conflicting statements by various authors.

The last pest dealt with by the author is Cydia (Carposijes) pomonella, L., which was studied by Miss A. P. Bragina and I. V. Nikitti Owing to the wet and rather cold summer, only one generation and 4

portion of a second were produced during the year. Out of hundreds of eggs of *C. pomonella* only one parasite was obtained, identified by N. V. Kurdjumov as *Trichogramma fasciatum* (Perkins); as no more eggs of *Uydia* were present the parasite was offered eggs of *Euproctis Arysorrhoea* and of various species of *Mamestra*, *Agrotis*, *Leucoma*, *Calocala* and others, also eggs of spiders, all of which it attacked. From one egg. from 2 to 21 specimens of the parasite were obtained and during 7 months 11 parthenogenetic generations were bred.

The Stations have also conducted observations on *Timetocera* excellana and on a Tenthredinid sawfly. The latter pest has done considerable damage to strawberries in the district of Berdiansk; it multiplies parthenogenetically, although both males and females have been observed. Spraying with Paris green in May is recommended as a remedy.

FUSCHINI (C.). Di un fattore non sufficientemente studiato nella utilizzazione dei microorganismi parassiti d'insetti nocivi. [An insufficiently studied factor in the employment of micro-organisms parasitic on injurious insects.] Riv. Vitic. Evol. Agrar., Conegliano. (5) xx, no. 4, 15th Feb. 1914, pp. 74-76.

The use of parasitic micro-organisms, to assist the agriculturist against his insect enemies, only dates back some 20 years. As in the case of predatory and endophagous insects, quite a new field has been opened up. It is presumed that microparasites exist, capable of reducing the numbers of most injurious insects to a negligible quantity under given conditions. The author holds this last qualication to be the important factor to be studied, if it be desired to reproduce the epidemic artificially. The receptivity of the intended victim is quite as important for infection as the presence of the parasite. The non-success recorded by Lounsbury in infecting locusts with the coloudlus acridiorum is probably due not only to a loss of virulence before use, as suggested by him, but also to defective receptivity on the part of the locusts. The conditions which influence the virulence of the microparasites and the receptivity of their hosts must be studied with equal care.

Issirin (-). Die Beseitigung der Insekten, welche den Wein- und Obstbau schädigen, durch Verklebung mit Hilfe von Moosschleim. [The removal of insects injurious to orchards and vineyards by sticking them with seaweed mucilage.]—Zeitschr. Pflanzenkrankheiten, Stuttgart, xxiv, no. 2, 28th Feb. 1914, pp. 78-79.

The author believes the employment of seaweed mucilage to be a new and promising method of insect pest control. The mucilage is prepared by boiling 4 lb. of Irish Moss or Iceland Moss (Fueus caragahen) in 20 gals, water for one hour, whatever is lost by evaporation being made up. After straining, a thick, slimy liquid results. On drying, this leaves a thin skin which gradually comes away in flakes. If the mucilage is sprayed on infested plants, the pieces which come away will be found to include the eggs and larvae of the pests. The spray must be applied only on dry days as rain will wash away the

mucilage and prevent the skin from forming. Still more effective results are attainable by adding 2 lb. of ethereal oil of mustard dissolved in 10 lb. of methylated spirit, to every 2,000-4,000 lb. of mucilage. This addition must only be made after the mucilage has thoroughly cooled; other insecticides may also be combined with the mucilage. Starch-paste appears to behave in the same manner as seaweed mucilage, but its sticking and killing powers seem less A sprayer giving a fine jet is required and thoroughness in application is necessary. In spraying for Clysia ambiguella in vineyards, not only the stocks but also the stakes and the surrounding ground must be wetted in order to include the eggs on the withered leaves and else. where. The development of the moth will regulate the spraying dates which may be about the middle of April, then before and after flowering and again after gathering the grapes. This method appears particularly suited for vine moth control. Mustard oil must be used with care as many varieties of the vine are injured by it. A few trial, should be made and it is necessary that the face and hands of the operator be protected. The cheapness of the material favours at widespread employment. If prepared at home, 100 lb. of mucilage with 3 oz. of mustard oil will cost about 2s. The mucilage alone is sufficient for control if used in time and with regularity.

Poisoned branmash for cutworms.—Ninth Ann. Rept. Ontar., Vegetable Growers' Assoc. [1913], Toronto, 1914, p. 79.

Onions are subject to serious attacks by certain cutworms which sometimes appear in great numbers in spring and early summer, and frequently do severe injury before their ravages are noticed. They cut off young plants at the surface of the ground and being voracious feeders may destroy many plants in a single night. The usual methol of control is by the use of poisoned baits. To a bushel of bran. 1½ lb. of arsenic, or Paris green, is added and mixed thoroughly into a mash with 8 gals. of water, in which has been stirred ½ gal. of sorghum of other cheap molasses. After the mash has stood for several hours is should be scattered in lumps of about the size of a marble at the bases of plants in fields where injury is beginning to appear. It should be applied late in the day, the cutworms being most active at night.

La désinfection des Plants de Vigne. [The disinfection of vines for planting.] -Rev. Agric. Vitic. Afr. Nord. Algiers. xii, no. 10°. 21st March 1914, p. 269.

The Service Phylloxérique of the Swiss Department of Agriculture has just recommended the following method of disinfecting vine plants intended for planting. The plants are dipped for 12 hours in a solution prepared by dissolving 2 lb. of soap in 30 gals, water and adding 6 lb of potassium sulphocarbonate with constant stirring. The roots of the plants must be well covered by the liquid, which must not, however, touch any of the shoots. A thorough washing of the plants completes the treatment, which appears to give perfect results.

ZNAMENSKY (A. V.). Почковый долгоносии Б. [Sciaphobus squalidus, tyl.]— «Труды Полтавской Сельско-Хозяйственной Опытной Станціи.» [Studies from the Poltava Agricultural Experimental Station], Poltava, no. 20, 1914, 32 pp. 5 figs., 2 plates.

In a short preface, N. V. Kurdjumov points out that this paper represents the results of three years' work conducted at the Station under his supervision, first by I. V. Nikitin and then by the author. The former's investigations have supplied valuable data as to the parasites of squalidus, while the latter has succeeded in discovering various important points in the bionomics of the larva.

I. K. Paczoski, in 1897-98, first recorded the damage caused by this weevil in Russia; in 1903, Mokrzecki recorded the insect amongst the pests of the vine, and since 1910 it has been mentioned in the reports of various other entomological stations (Kiev, Smiela, Stavropol and Kishinev); but at the same time, no mention of the insect occurred in many reports from districts (Kursk, Ekaterinoslav, Poltava, (harkov) where it exists in vast numbers and does enormous damage. In European Russia the insect is found over the whole of the South, including the Crimea and the North of Caucasus; it has been found in the governments of Kursk, Kiev, Charkov, Poltava, Cherson and Bessarabia, but probably it exists also in many others. In many districts infested by S. squalidus, there occur isolated localities which are free from it, while all surrounding orchards are suffering from swarms of the insects. S. squalidus appears generally in the second half of April, but in 1913 it occurred in the first half of that month. While there are still few green plants, the weevils feed mostly on buds, attacking pears, apples, plums, cherries, apricots, and service trees, and raspberry, gooseberry and current bushes, besides many forest trees. In the government of Poltava it was never found on Fraxinus exclsior, Gleditschia triacanthus, or white and yellow acacia trees. The majority remain on fruit trees and bushes, damaging the buds, reluding the flower buds, which sometimes wither and fall off. The percentage of injured buds ranges from 36 to 50 per cent. It is very easy to distinguish the damage done by S. squalidus from that done by Anthonomus pomorum; it eats out larger holes of irregular form, not round, as is the case with the latter species. The ovaries of the female are quite undeveloped when the beetles emerge, and the maturing of the eggs takes from 3 to $4\frac{1}{2}$ weeks; the males are quite mature on emergence. Oviposition starts every year on approximately the same day, the 10th May, in 1911 and 1913, while in 1912 it was two days earlier. The eggs are deposited underneath the turned over edge of a leaf, or occasionally between two leaves stuck together; the Process of oviposition is described. In captivity the females oviposited freely on leaves of Pirus aucuparia, Garth, and on raspberries, but orly a few on leaves of Urtica; in the open in the garden of the Station, same preference for Pirus aucuparia was noticed; the eggs were frequently found also on apple, pear and plum trees, as well as on oak, Eumymus, Ulmus pedunculata and very often on Corylus avellana. thly once were eggs found on clover. Most of the eggs are deposited duning one week, after which the beetles gradually disappear, so that why single specimens can be found at the middle of June. The same mode of oviposition is common also to Eudipnus micans, F., the eggs (37) Wt. P86/57. 2.4.14. 1,500. 6.14. B. & F. Ltd. Gp.11/3.

laid by the latter being however more numerous and turning brownish after 3-4 days, while the eggs of S. squalidus remain white.

The eggs hatch in about 12 or 13 days, and the larvae immediately drop to the earth. Paczoski previously assumed that the larvae live in the earth and the observations in 1912 by Nikitin supported this the author's investigations have also proved that the larvae feed on the roots of trees and that they pass two years there before pupating Large larvae were discovered along the roots of a service tree and microscopical examination of their intestines showed the presence of tissues of bark (liber), the roots bearing clear evidence of injury : the same results were also obtained experimentally. The larvae which emerge in spring do not finish their development the same year, but pupate only in August of the following year, producing beetles in September which winter again and issue from the earth only in the following spring. The author has not been able to ascertain the number of moults and only once did he find a freshly moulted larva with the old skin still near it; usually the larvae devour the old skin The pupa lies at a depth of 18-25 inches, which is also the average depth at which the larva lives. It is assumed that S. squalidus belongs to the type of insects which periodically multiply to enormous numbers. doing great damage in these years and afterwards gradually disappear ing to quite negligible quantities; the years 1897-1898 were years of its minimum, the numbers increased during the following years and they have decreased again during the past three years. attributed to the activity of parasites.

The imago, larva and pupa of S. squalidus, owing to their subter rancan habit, have few dangerous enemies; thus only the eggs are exposed to attacks of various parasites. Chief amongst these must be placed Anaphes sp., of the family MYMARIDAE, which is to be described by Kurdjumov; the infection of the eggs by this parasite is given as 52 4 per cent, for last year. They were mostly infected on the day on which they were laid, and the development of the parasitoccupied 10-11 days in the insectarium. The process of oviposition of the parasite is fully described, the ovipositor being driven through the leaf with which the eggs of the hosts are covered. Evidently the sticky material ejected by the female beetle to hold the leaf r place provokes the desire to lav eggs in the parasites; for they draw their ovipositors through a leaf from which all the eggs were removed. but paid no attention to eggs offered without a leaf. Only those eggs which were infested early in their development produce parasites. when the embryo of the host has already developed there is evidently not sufficient nourishment left for the parasite, which perishes with the host.

Two species of Eulophus act as ectoparasites of eggs of S. squalidas. One of these species emerges from the pupa during the same summer, while the second one winters in the pupal stage on the same spot where the eggs of the host were situated. These species are not numerous and destroyed only about 9°2 per cent. of eggs in 1913. Each larva of the parasite requires 5–6 eggs of the host for its development; the larval stage lasts 10–11 days; the pupal stage of one of them 12–14 days. The eggs of S. squalidus are also destroyed by various predaceous insects such as Aelothrips fasciata, Hal. and Haplothrips acuteata kurdjumon. Karny, subsp. nov. The author describes the larva of the latter

found by Kurdjumov on colonies of Aphis crataegi, Kalt., which they possibly also destroy. The egg stage of this predator lasts 5-6 days, its larval stage 22-25 days, propupa 1-2 days, and pupa 4-5 days, on the average. This Thrips pierces through all the eggs of the heap, thus arresting their further development, and then feeds on them, otherwise it would not be able to accomplish its development, as the eggs of the host hatch in 12-13 days. All these parasites together destroysome 64-4 per cent. of eggs of S. squalidus; a table showing the perentage infested by each of them during the investigations of 1913 is given; all of them attack also the eggs of Eudipnus micans.

The author then deals with remedies and first describes those applied by some fruit-growers in the government of Taurida. These consist of trenches, usually with straight walls, dug round the trees, or of concal heaps of earth round the trunks, covered with fine sand and surrounded by a trench. None of these obstacles seem very effective

surrounded by a trench. None of these obstacles seem very effective in preventing the beetles shaken off the trees from getting back to them. Other appliances are more fully described in the report of the Entomological Station of Kiev for 1912 [see this Review, Ser. A, i, pp. 397.] Shaking down the weevils on to sheets was also tried at the station of Poltava during the investigations in 1911 and the results obtained, as shown by two tables, although not conclusive, are conselered useful. Picking out specimens of ladybirds which may get on the cloth, before destroying the insects shaken down, is suggested. The remedy most recommended is the use of belts of American tanglefoot. The author gives several tables relating to the experiments in 1912 and 1913, which all show the excellent results obtained by this method. An adhesive made from a recipe suggested by Mokrzecki is also very effective: - 1 lb. of castor oil boiled with & lb. of resin; if correctly prepared this is as good as tangle-foot. The author agrees that adhesive belts serve rather to drive away the insects, as it is very soldom that beetles are caught by them. Should there be any fruit bushes or vines in the orchard, care must be taken to protect them from the beetles by means of trenches, and the insects must be collected from the trenches as well as from the bushes.

Union (F. W.). Description of a New Froghopper from British Gulana. Bull. Entom. Research, London, v, pt. 1, April 1914, p. 43, 2 figs.

A new species of froghopper taken on grass and occasionally on shear cane in British Guiana is described under the name *Tomaspis* facilities.

Swage (R. E.). The Respiratory System of Monophlebus stebbingi, var. octocaudata.—Bull. Entom. Research, London, v, pt. 1, April 1914, pp. 45-47, 5 pl.

A detailed description is given of the respiratory system of Monophilans stebbingi, Green, var. octocaudata, Green, which differs from the majority of Coccids in having in addition to the meso- and metathoracic pairs, seven pairs of dorsal abdominal spiracles. This species is found on mango, jack fruit and species of Ficus in India, but as its life-history is comparatively long, it is rarely a pest; climatic conditions govern the production of large numbers of the individuals, so that outbreaks are irregular.

Ballard (E.). Two Pests of Mahogany in Nyasaland.—Bull. Enlow. Research, London, v, pt. 1, April 1914, pp. 61-62.

The caterpillars of two moths, Heteronygmia leucogyna and Mussidia albipartalis, attack mahogany trees in Nyasaland, causing a large amount of damage every year; the former eats the leaves to the extent of defoliating whole plantations, while the latter bores under the bark, causing much deformity of young trees and the formation of corky excrescences, accompanied by the exudation of resin. The life. history of Heteronygmia leucogyna is as follows: The eggs are laid in batches of 150-200, low down on the trunk of the tree; the young larvae emerge at the end of nine days, and are pale yellow in colour with bunches of fine hairs, and measure 3 mm. in length; the fully grown larvae may be pale or dark in colour, with dark heads, and ar-flattened; their length is 3 cm. The pupa is formed in a very slight. cocoon consisting of a few threads, generally on the under side of a leaf or on an excrescence on the bark; the pupal period lasts for ten days. Both larvae and eggs of H. leucogyna are heavily parasitised. two species of CHALCIDIDAE and one Ichneumon, Ecthromorphe variegata, Brullé, have been bred from the larvae; in May and Junnearly 90 per cent. of eggs collected were parasitised, but those found in September and October were unaffected.

The life-history of the bark-borer, Mussidia albipartalis, has not been fully worked out; the eggs, apparently laid on the trunk, giverise to larvae which at once bore into the bark; pupation occurs in a cocoon of tough white silk under the rough excrescences produced by the borings of the larva. The insect is parasitised by an Ichneumon and a Chalcid, but not to a sufficient degree to be an important check.

Витику (І. С.). Отчеть о дъятельности Прибалтійской станція по борьбъ съ вредителями нультурныхъ растеній при Римсковъ Центральномъ Сельско-Хозяйственномъ Обществъ за 1913 годъ. [Report on the work done at the Baltic Station against pests of cultivated plants by the Central Agricultural Society of Riga for 1913.]—Wenden, 1914, 28 pp.

This is the first yearly report of the Baltic Entomological Station in Wenden and it gives a short history of the organisation and establishment of the Station.

The following were the chief insect pests of field crops. Wireworms of the genus Agriotes occur over the whole country, damaging mostly summer-sown cereals and roots. Apion apricans, Hbst., is so abundant that it is nearly impossible to find heads of clover not infested by the larvae. Some 500 insects were reared from the cocoons and also two specimens of the Braconid parasite, Eubacus macrocephalus, Nees Apion violaceus, Kirby, was also found on clover, but less frequently. Species of Sitones injured seedling peas and vetches. Species of Phyllotreta, in 1912, destroyed all the turnips, also injuring cablagingues and beets. Cassida nebulosa, L., is not common, but is very injurious in some localities to beet-roots; in 1912 a whole field of least was almost completely devoured by this pest, 5-10 beetles occupations.

There are no exact data showing that the larvae of Euroa segetum, Schiff. have injured winter-sown cereals during the last two years, but it has been ascertained that these insects occur in the fields of potatoes, beet-roots and carrots. As many as twenty larvae were sometimes found underneath one root of beet; carrots were in some localities injured by them to such a degree that the injury was ascribed to hares; they were found also underneath onions. Species of Cydia timpholita) are spreading over the country to such a degree that the cultivation of peas has become impossible, up to 75 per cent. of the seed being injured by these caterpillars.

Chlorops taeniopus, Mg., was found in 1913 on barley in the fields of the Freidenstein School, 5 per cent. of the plants being injured by this fly. Oscinis frit, L., is frequently found.

With regard to orchards and market-gardens, the following pests are mentioned:—Anthonomus pomorum, L., together with Cydia pomonella, L. is very widespread and does great damage. Rhynchites betuli, F., scarce. Pieris brassicae, L., and P. rapue, L., are abundant. Aporia estagi, L., and Vanessa polychloros, L., are seldom found: Hyponomeda malinellus, Z., occurs in large numbers in some localities and stips the apple trees. Barathra (Mamestra) brassicae, L., proves more injurious to cabbage than Pieris brassicae. Nematus ventricosus, Ki, is very injurious in some localities to gooseberries and currants. Contophila brassicae, Bouch., is common.

The following insect pests of forests are reported: Rhyacionia Estria) resinella, L., frequently on young pine trees; Eucosma Grapholita) tedella, Clerk, on firs, especially young plants; Lymantria reserver, L., in large numbers in the forests of Kurland.

Independent of the Kier, no. 10, 27th March 1914, pp. 332-338.

This is a report of work on insect pests done during 1913 at the Sation of Kiev by I. S. Ljubomudrov, who investigated the habits of various Microlepidoptera of the subfamilies OLETHREUTINAE and TORTRICINAE; by I. F. Bay and D. I. Lessovoy, who dealt with the jests of grain crops; and by B. I. Belsky, who studied Byturus tomenters. Bjerk.

Rearraria leucatella, L., was found in spring shoots of apple trees, is a short longitudinal mine underneath the bud, causing all the leaves to the shoots to wither. Some of these shoots were cut off on the 19th May and put into water in the laboratory; the caterpillars grew weekly, remaining all the time inside the stem, and at the end of June 19pated in their mines; the moths emerged on the 12th and 13th July. In the 9th July some small parasitic Hymenoptera issued from one shoot. The author remarks that this is the first time that caterpillars of Recurraria leucatella have been found inside the stems, as, according to the usual statements, they live inside curled leaves; only the

caterpillars of Laverna hellerella, Dup,* and of Recurvaria nanella, Hb, have been previously reported to live inside shoots of apple and pear trees.

OLETHREUTINAE and TORTRICINAE. In the spring of 1913 the leaves of apple trees in most of the orchards in the government of Kiev were damaged by various moths of these subfamilies, on some trees all the leaves being curled. The following species were studied Tmetocera ocellana, F., Olethrentis variegana, Hb., Pandemis releving. Hb., var. cerasana, Hb., and P. heparana, Schiff. The caterpillars of T. ocellana pupated on the 25th-28th May. Before pupating the caterpillars emerged from the curled leaves, in which they lived and wove a white cocoon beneath the turned end of a fresh leaf; some pupated even on the walls of the box, or underneath the gauze coverned it. Cocoons of these insects were found in the open on the 19th Max In the laboratory the moths emerged on the 11th and 12th June. The caterpillars of Olethreutis variegana were found on the 19th Mar pupating on the 24th and 25th of that month in the same leaves which they had inhabited; the moths issued on 30th and 31st May, The caterpillars of Pandemis ribeana var. cerasana and of P. heparae; pupated between the 23rd and 28th May, between two fresh leaves drawn together; the moths emerged on the 1st and 5th June. In the open the cocoons of these insects were found on the 19th May; on the same day a caterpillar was found with an egg of a Tachinid situated on the first segment of its thorax, on the upper side; this caterpolar pupated two days later and the fly issued in 12 days.

An attempt was made to trap Euxon (Agrotis) segetum in troughs of molasses, which were placed on fallow land and in beet fields at the rate of four to the acre, but of the insects caught only 2 per cent, belonged to this species. Some digging conducted in August on one estate where the caterpillars of E. segetum were injurious during the spring resulted in the finding only of two pupae, both of which were parasitised by Ambliteles radatorius, Ill. Only a few moths of the second generation appeared owing to the large number of parasitised large. The first eggs of the second generation were found on the 3rd September

Byturus tomentosus, F., is a serious pest of raspherries; this beetle hibernates in Western Europe in the pupal stage, but in the governments of Moscow and Kiev it winters as an imago.

Psylliodes picina, Marsh., did great damage in spring to summer and winter-sown cereals on one estate; and were also found in August on trap crops of barley. At night and in cloudy weather the beetles remained in the earth, but in fine weather, in the day time, they feel on the leaves of the grain. Between the 31st August and 6th September copulating pairs were noticed. In the first half of October the beetles buried themselves in the earth to a depth of about an inch. This is the first time that this insect has been recorded as a pest of grain.

Mayetiola (Cecidomyia) destructor, Say, was found on the 28th July in a wheat field on one estate in the pupal stage, 10 per cent of the plants being attacked. On the 1st September small numbers of the larvae were discovered there in seedlings of volunteer wheat.

^{*[}Mr. J. H. Durrant suggests that the species intended is probably Laterna atra. Hw., the larvae of which live in apple shoots in spring: the larvae of L. hellerella, on the contrary, feed in hawthorn berries in autumn—ED.]

Oscinella (Oscinis) frit, L., was found in very large numbers on one estate: on the 3rd July a trap crop of barley was sown, and in August it was found that 90-100 per cent. of the plants were infested. Preventive measures consisted in reploughing the trap fields and ploughing in the germinating fallen grain; and these proved very effective, in infestation of only 6 per cent. being found in the winter-sown crops. About 14-15 per cent. of the pupae were infected with parasites. On another estate 30 per cent. of the young volunteer wheat was attacked and 15 per cent. of the winter crop.

CHILDS (L.). The Anatomy of the Diaspinine Scale-Insect, Epidiaspis piricola, Del Guer. Ann. Entom. Soc. America, Columbus, vii, no. 1, Mar. 1914, pp. 47-57, 3 pl.

An account of the anatomy of the Italian pear scale.

GILLETTE (C. P.). Some Pemphiginae attacking Species of Populys in Colorado.— Ann. Entom. Soc. America, Columbus, vii, no. 1, Mar. 1914, pp. 61-69, 1 pl.

The following Aphids of this subfamily which attack poplars in colorado are described: *Thecabius populiconduplifolius*, *Asiphum* ekodi, sp. n., and *Mordwilkoja eugabunda*.

Howard (L. O.). Report on Parasites.—Ann. Entom. Soc. America, Columbus, vii, no. 1, Mar. 1914, pp. 86-89.

The report gives an account of the results of disseminating the sarasites of the gipsy moth and the brown-tail moth in the infested areas during the past year. Owing to the fact that one of the imported ega-parasites of the gipsy moth, Anastatus bifasciatus, breeds very souly, extensive collections were made during last winter of parastised gipsy moth egg-clusters from colonies planted in previous wars. From this material it was possible to liberate 1,500,000 parastes: these were placed in 1,500 colonies in sections where the insect had not become established. Colonies of Anastatus planted a year ago proved to be successful, although the spread was slow. Another exparasite of the gipsy moth, Schedius kuvanae, has become perjetly established in several places where it had been planted; its numbers had increased and in some cases it had spread nearly a mile and a half beyond the limits of last year's area. The Tachinid Comp-And concinnate was abundant in the summer of 1912. Limnerium is paridis and Apanteles sp., received from Europe, survived the winter and are established; in the case of the latter species, 7 per cent. of parasitism of gipsy moth larvae was found; Limnerium has so far shown no marked ability to increase. Another species of Apanteles, buttely A. lacteicolor, an important parasite of the brown-tail moth, has been recovered in large numbers and has been found to attack spay moth caterpillars in widely separated regions. The Calosoma '--tle (C. sycophanta) has been observed in large numbers where had colonies of the gipsy moth were present; the good done by the beetle, which feeds upon the pupae as well as upon the larvae, is considerable. Munodondomerus aereus was found to have spread over practically the entire territory known to be infested by the brown-tail moth; Pteromalus egregius occurs over the same area, its numbers being on the increase.

Collins (C. F.). The Peach and its Culture.—Mthly. Bull. State Comm. Hortic., Sacramento, Cal., iii, no. 3, March 1914, pp. 144-149.

The author states that the peach worm or twig borer (Anarsu lineatella), which is one of the most serious insect peats of the peach in California, is best controlled by spring spraying with lime-sulphur. Mention is also made of the almond mite which often attacks trees in the interior valleys during early summer. These are effectively controlled by dusting the trees with flowers of sulphur, which should be used as soon as the mites appear, with a hand-operated sulphur machine from a wagon, in order to reach the tops of the trees where the mites are most numerous. One man with a steady team should easily cover 400 fully-grown trees in ten hours.

COOLE (A. J.). Idaho Quarantines against California. —Mthly. Bail. Sta. Commis. Hortic., Sacramento, Cal., iii, no. 3, March 1914, p. 156.

The importation into the State of Idaho of potatoes from California has been prohibited, on account of the prevalence in the latter State of the potato tuber moth (Phthorimaea operculella). Idaho has also placed an embargo on all shipments of nursery stock from 21 California; counties, because of the ravages of the pear thrips (Euthrips proin their orchards. While recognising the necessity of keeping orchards free from pests, the author's investigations lead him to think that this embargo is unnecessary, as it is doubtful if the insects are in the soil in the nurseries. Should they be in the ground whereyoung trees are grown, the thorough washing of the roots would undoubtedly remove all danger.

BORODIN (D.). О мѣрахъ борьбы съ проволочнымъ червенъ. [Measures against Elaterid larvae.] - «Хуторянинъ» [Chatarianin], Pollava, no. 12, 2nd April 1914, p. 382.

The author states that the best remedies for Elaterid larvae are various baits, poisoned or otherwise, consisting of slices of potatoscarrots, beets, oil cakes, cabbage stalks, etc., which are buried in the earth at a depth of 3-4 inches in various parts of the fields. These baits are poisoned by adding to them either Paris green or arsenic, in which case they need no further attention; in case of unpoisoned baits they must be inspected practically every week and the larvae found on them destroyed with boiling water. He also recommendanize baits, prepared as follows: About \(\frac{1}{4}\) lb. of white arsenic and \(\frac{2}{2}\) lb. of naize well boiled in about \(\frac{2}{2}\) gallons of water, care being taken not to inhale the vapour.

The baits can be best used in autumn and spring, before sowing, or even afterwards, so long as the seedlings are not too high.

The Narcissus Fly (Eumerus lunulatus).—Gardeners' Chron., London, 28th March, 4th and 18th April 1914, pp. 223, 240 and 272.

Referring to the case of a narcissus bulb containing larvae of the small narcissus fly (Eumerus lunulatus) exhibited at a meeting of the Roy.

Hort. Soc. Scientific Committee, Mr. A. J. Bliss writes stating that, although more knowledge is wanted, evidence is strongly in favour of E. landatus being merely a scavenger, feeding on the excreta of Meredon grubs which inhabit the bulbs, or on decayed bulbs which have been attacked by fungoid diseases; the facts that the larva can be seen at variety of plants (rhizomes of iris, etc.), has no special foodplant, and has only done harm when Merodon or fungi have previously attacked the bulb, support the author's arguments. Mr. C. E. Shea, however, believes that the larvae are not hatched on the bulbs and the does not think that the larvae is only a scavenger, since his own expenence does not clearly demonstrate the relationship with Merodon or fungoid diseases.

нов sky (P.). Намъ уничтожить муравьевъ. [How to destroy ants.]
«Прогрессивное Садоводство и Огородничество» [Progressive Fruit-growing and Market-gardening,] St. Petersburg. no. 13, 12th April 1914, pp. 403-404.

The author suggests the following remedies against ants: Spraying over ant-hills and spots attacked by ants with powdered caustic lime gas good results; if scattered round the trunks of trees it will prevent the ants from passing on to them, but the lime must be renewed from time to time. A lump of caustic lime placed inside an ant-hill will seen exterminate the insects if plenty of water is poured over the spot. Ant hills may be treated with one-half to one pint of tar or kerosene in a gallons of boiling water. A solution of $\frac{3}{4}$ lb. of hyposulphite of soda a 5-pints of warm water is also useful and is harmless to the roots of trees, though on beds of plants a weaker solution must be applied and repeated in 1–2 weeks. In order to prevent ants getting on to trees, but of cotton wool moistened with 20 per cent, carbolic acid may be useful.

VILLET (A.). Utilisation de Certains Insectes Phytophages dans la Luite contre les Ennemis des Plantes Cultivées. [Utilisation of certain phytophagous insects in combating pests of cultivated plants.]—Révue Scientifique, Paris, 25th April 1914, pp. 526-530.

A general account is given of the usefulness of certain insects, themelies phytophagous, in combating pests of cultivated plants. They may be useful in acting as hosts for entomophagous species which prey deat the pest, such as Siphonophora leptadeniae, which harbours the lotasites of Aphis sorghi, and Barathra (Mamestra) brassicae, which at as a host for the parasite Trichogramma semblidis of the vine pest Polychrosis botrana. Another example given is Alubama argillacea, casual pest on cotton, but which is nevertheless useful, provided it dipears late, in suppressing indirectly the far more dreaded annual lest Anthonomus grandis by robbing it of its food supply.

VULLET (A.). Note synonymique sur le Thrips des Pois. [Synonymy of the Pea Thrips.]—Bull. Soc. Entom. France, Paris, 1914, no. 5, pp. 161-162.

The pea thrips has been referred to by different writers as Thrips

pisivora, T. physapus, Physapus robusta and Frankliniella robusta. The author points out that all these names refer to a single species, and also that neither Thrips nor Physapus can stand as names for genera, so that the correct name is F. robusta.

LEONARDI (G.). Contribuzione allo studio delle Cocciniglie dell'Eritrea (Africa orientale). [A contribution to the study of the Coccids of Eritrea (East Africa).]—Boll. Lab. Zool. Agrar. R. Scuola Nap. Agric., Portici, vii, 1913, pp. 27-38, 12 figs.

The author describes four new species of Coccids from Eritrea: Ceroplustes erithracus found on Aracia, Saissetia cuneiformis and Lepidosaphes fiorii on Rhus aztechesan, and Pulvinaria dicrostachys on Dichrostachys nutans.

LEONARDI (G.). Nuove specie di Diaspiti viventi sull' Olivo. [New species of Diaspinae living on the olive tree.]—Boll. Lab. Zeal. Agrar. R. Scuola Sup. Agric., Portici, vii, 1913, pp. 66-71, 5 figs.

Two new Coccids, described by the author as Aonidia olear and Lepidosaphes olivina, and a species of Aspidiotus were found on olivities on the Eritrean tableland.

LEONARDI (G.). Nuove specie di Cocciniglie raccolte in Italia. [New species of Coccids collected in Italy.] - Boll. Lab. Zool. Agrar. R. Scuola Sup. Agric., Portici, vii, 1913, pp. 59-65, 5 figs.

The following three new species of Coccids collected in Italy ardescribed: Pseudococcus grassii found on some bananas bought at Rome, Aspidiotus viticola on the vine and Aonidiella inopinata on the almond.

SZÉPLIGETI (Gv.). Braconidae gesammelt von Prof. F. Silvestri in Africa. [Braconids collected in Africa by Prof. F. Silvestri.] Boll. Lab. Zool. Agrar. R. Scuola Sup. Agric., Portici, vii, 1913. pp. 101-104.

The following Braconids are described: Bracon celer, sp. n., from Cape Colony; Bracon lugosianus, sp. n., Pseudobracon nigripenno. Szépligeti, Pseudobracon silvestrii, sp. n., Pseudodryotes camerumo. Szép., and Biphymaphorus pulchripennis, sp. n., from Lagos; Disophres lutea, Brul., Cremnops rufitarsis, sp. n. and Cremnops variabilis. Szépfrom French Guinea; Cardiochiles longiceps, Rom., from Senegal: Biosteres candatus, sp. n., from Nigeria.

RAZZAUTI (A.). Presenza e danni del Pantomorus fulleri in Italia. [Pantomorus fulleri, its occurence and the injury caused by a in Italy.]—Boll. Lab. Zool. Agrar. R. Scuola Sup. Agric., Portary, vii, 1913, pp. 113-124, 7 figs.

Systematic notes, a full description of the various stages, the distribution and a bibliography of this Curculionid, known in the United States as Fuller's Rose Beetle, are given in this paper. First observed in the United States in 1879, the injury caused by P. fulleri has been of common occurrence since it is markedly omnivorous both in the

larval and adult stages. In the southern States, such as California. it lives in the open and seriously damages citrus plantations, while m colder regions, fruit and ornamental trees in the greenhouse are subject to its attack. The rose and geranium suffer severely and its other hosts include a great variety of garden plants, as well as almond Amongst species of Citrus it specially attacks C. Immonum and to a less degree C. aurantium and C. bergamina, while C. colouris and C. deliciosa have not been touched. In 1913, trees growing in the open were attacked, though at Leghorn during recent vears, citrus trees in pots, but not those in the open, have been infested. Both the small and the larger roots are attacked by the larva and the author has observed fungus spots on the surface of the injured roots. The plants look sickly, lose their leaves and finally wither. The imago feeds on the young buds and the mature leaves, which may by skeletonised in severe cases. Pantomorus further damages the young fruit by boring them at the point of attachment, thus causing them to wither. In Italy the beetles first appear towards the end of June, and being mostly nocturnal in habit, remain on the plant during the day. Oviposition takes place from the middle of August right through September. The eggs are laid in masses of 30 to 60. toya which hatches out in from 21 days to a month, at once burrows on the soil and attacks the young roots which are nearest the surface. In Italy the larval stage lasts until the end of the following spring, and the pupal stage from 20 to 30 days. P. fulleri seems to have been arst observed in Italy in 1898, when it was found in Liguria, whence it said to have been imported to Leghorn in 1908. In view of the extensive culture of Citrus in Sicily, it is to be hoped that its present arcumscribed range may be maintained.

In the United States the natural enemies of P, fulleri are little known, but artificial methods of control, such as injections of carbon assulphide, kerosene emulsion or tobacco extract, are stated to give produces. As the damage done in Leghorn is very slight, the author has not tried any of these remedies and has simply advised immersion of the plants in water for one or two days, which method has proved effective. Like most other Curculionids P, fulleri drops to the ground when touched, and by spreading a white sheet beneath the plant indested, the weevils are easily shaken off and collected. Subsequent banding of the trunk at a little distance from the ground will prevent a further infestation.

CECCONI (G.). La Grapholitha leplustriana, Curtis, dannosa al cavoli coltivati. [Cydia leplastriana, Curtis, as a pest of cauliflowers.] – Boll. Lab. Zool. Agrar. R. Seuola Sup. Agric., Portici, vii. 1913, pp. 125-148, 1 pl.

Up to now the caterpillar of this moth was supposed to live exclusively on wild cabbages (Brassica oleracea var. silvestris, L.), but the author has discovered it in Italy on cauliflowers cultivated at Fano, in the Province of the Marche. The peasants there have known as a pest for many years and on account of its ravages they now sow the seed after the 24th June instead of before, as was their former custom. In 1912, for instance, sowing was put off until about the 25th of July. In time, however, the insect has modified its habits

accordingly and late sowing is now no remedy. Two generations occur annually. The larva eats away the terminal bud, though even in years of severe infestation a large number of plants escape.

Control may be effected (1) by destroying the young plants which are infested; (2) by putting such plants in developing boxes in order to bring out and develop any possible parasites in the caterpillars: (3) by covering the beds of plants just above the ground with gauze, so as to prevent the moths from ovipositing on them. In this case some plants should be left as traps and such as become infested should be dealt with as under (1) and (2).

GRANDI (G.). Descrizione di un nuovo Coccinellide africano, Serangium giffardi, sp. n. [Description of a new African Coccinellid. Serangium giffardi, sp. n.]—Boll. Lab. Zool. Agrar. R. Scuola Sup. Agric., Portici, 1914, pp. 165-178, 8 figs.

A description is given of Serangium giffardi, which was collected in Nigeria and in the Cameroons by Professor Filippo Silvestri. Both the adult beetle and its larva are actively predaceous on Aleurophiae.

RODZIANKO (V. N.). О миндальномъ съмятьсь, повреждающемъ сливы и абрикосы въ Астраханской губерніи.—{On Eurytomet amygdalis, Enderlein, which injures plums and apricots in the govt. of Astrachan.] Kiev, 1913, 10 pp.

Eurytoma amygdalis was first described by Enderlein in 1907, when it was assumed to be a parasite, although the host was not known; it was obtained by K. Malkov in Bulgaria from mature seeds of almond, and nearly at the same time by J. F. Schreiner in the government of Astrachan, where its larvae damaged plums and apricots. The author refers also to some similar investigations on this insect by A. F. Fortunatov and by S. A. Mokrzecki in Astrachan.

The mature larva of Eurytoma amygdalis hibernates inside the store of a plum or apricot, pupates there in spring and the image emerges soon afterwards, having gnawed a hole in the walls of the stone and through the fruit. The female lays its egg inside the young fruit and the larva lives inside the stone, feeding on the unripened kernelione larva lives inside one stone and usually destroys the whole kernel The attacked fruits fall off either when still green or in a half maturel state, though some are able to ripen and cannot be distinguished from healthy fruits. The author believes that this is due to the long period over which the females oviposit; if the egg has been laid early, the larva is able to destroy the kernel, thus causing the fruit to fall prematurely; if the egg has been laid later the fruit may be able to ripen. This assumption requires confirmation.

One generation of the insects occurs during the summer. Schreiner assumes that the females lay the eggs in the parenchyma underneath the epidermis, but the author thinks that it may also be true that the female pierces with its ovipositor through the parenchyma and the walls of the stone, which are then still soft. The author describes the larva and pupa and corrects, by request of Günther Enderlein, an error in the description of the female by the latter; the annulus soft the antenna) is as broad as or slightly broader than long, not twice the state of the description of the female by the latter;

as long as broad, as stated in the description.